American Machinist

DECEMBER 2, 1957 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Gaging Policy

PAGE 100

Checking a jig for function and accuracy—see page 2

Russia hardens work on machine tools, page 97

Producing flutes in plastic parts, page 106

Production machining on die sinkers, page 110

Wet machining of cast iron, page 113

NEWS INDEX page 81
CONTENTS page 1

Here's Why

BORE-MATIC VERSATILITY SAVES MONEY

on Any Automated Production Line

When the time comes for a job changeover, you can do it at a saving with Heald Bore-Matics

Heald Slide Units Simplify Automation

The Heald *Slide-Unit* is the basic "building block" of an automated Bore-Matic production line. This simple, compact, hydraulically operated unit, complete with boringhead and drive, can be mounted in any position and can approach the work from any angle. It can be tooled for any desired operations — from roughing to precision finishing.

Because each Slide Unit is a separate and completely self-contained machine—arranged through interlocking control circuits to function as a fully automatic segment of the entire production line — individual machines can be added as required.

THE versatility of a Heald Bore-Matic has often been cited in terms of the machine's ability to perform a number of operations simultaneously. But this basic versatility has another advantage—one that is particularly important where large, automated equipment is involved. It *protects your investment* against the danger of early obsolescence!

For example, a Heald automated production line consists of the required number of *basically standard* Bore-Matics — tooled up to perform the required operations on a specific part. The machine becomes "special" only where part design requires it. Upon completion of the job for which the machine was designed, it can usually be re-tooled and put to work on a brand new operation — with a minimum of structural changes. This simplicity and economy of job changeover eliminates much of the "risk" in planning a long-term investment in automated equipment.

If you want a production line that's *protected against obsolescence*, talk to your Heald representative about Multi-Unit Bore-Matics, another example of why *It Pays To Come To Heald.*

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THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

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see page 2

American Machinist
METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 81
. . . Washington . . 83
. . . Detroit . . 85
. . Aircraft and Missiles . . 87
. . . Machine Tools . . 89
. . . What's Ahead . . 91
. . . General News . . 138
. . . Field Report . . 144
. . . Names . . 147

Departments...

Letters . . 74
Editorial . . 95
Practical Ideas . . 125
Round Table . . 121
. . . Discussion . . 182
Talking Shop . . 137
New Equipment . . 148

contents for December 2, 1957

VOLUME 101, NO. 25

Spark plus arc hardens steel in Russia . . . Hardening is done at the machine tool by this method, with the electrode replacing a cutting tool. . . 97

Quality control begins with a gaging policy . . . Here's how good gages, jigs, and fixtures are slashing rework and assembly delays. *By Rupert Le Grand*. 100

Wanted: improved anchoring method . . . Anchor bolts used for machine tools are awkward and costly. Here are five requirements that should be met by a new method. *By H K Lee, Ford Motor Co.* 105

"Lost wax" builds de-iceable radomes . . . Connected flutes are provided in plastic by a variation on the "lost wax" casting process. *By Gene Mooring and Carl Demons, Douglas Aircraft Co.* 106

Brazing makes metal hose of coiled wire . . . "Convolutions" of nickel iron wire are furnace brazed to form the core of flexible metal hose. *By Frederick C Schaefer and Thomas Admerand*. 109

Production machining with die-making equipment . . . Keller machines, radial drills, and special equipment produce structural parts for aircraft. *By George H DeGroat*. 110

Cadillac mechanizes for adaptability . . . Developments include steel rules dies to trim blanking costs, changeover tooling for the pressroom, wet CI machining. *By George H DeGroat*. 113

Shop shots . . . Automatic molding operation, track-mounted radials, air-operated chuck, chucking a 2200-lb load in a lathe, aluminum table for milling. . . 122

Rubber cement grips parts for machining . . . Delicate dial rings that must be faced and bored without distortion are clamped with cement. *By John Dow, Minneapolis-Honeywell Regulator Co.* 124

REFERENCE BOOK SHEETS

Hardness of metals . . . A table of familiar metals arranged in descending order of hardness. *By H L Campbell*. 131

Standard grooved pins, I, II . . . Six types of groove pins, lengths available, and appropriate hole sizes are covered in this proposed standard. 133

American Machinist chips

Cover . . .

A fixture is checked by a gage inspector at Warner & Swasey in this picture taken by Ralph Thompson. Details at left.

Gaging quality . . . All jig and fixture inspection at Warner & Swasey is handled by qualified gage inspectors who check to see whether all jigs and fixtures, as built, will actually locate correctly. This leads us to the point that quality control must begin with a gaging policy. Rupert Le Grand has studied the gaging methods at Warner & Swasey, where such a policy is slashing rework and assembly delays. You'll find a full report on the policy and how it is applied in the article on page 100.

Soviet news . . . For years we've been doing our best to monitor technical developments in the Soviet Union (sometimes in the face of sharp criticism of this practice). Recent developments on the earth satellite program have driven home the fact that we can learn from Russian research. Perhaps the most spectacular result to date from this study was the original report on work with ceramic tools. In this issue, on page 97, you'll find a description of how spark plus arc is hardening steel in Russia by using an electrode instead of a cutting tool on the machine.

Long distance . . . Once in these pages we commented on how rarely the average reader tells us how he feels about the articles we publish, how often he goes directly to our original source with his comments and questions. Thus we were startled all the more, the other day, when a reader *telephoned* us from California to tell us the report on "The Impact of Automation" (*AM*—Oct 21 '57, p165) was the soundest analysis of the subject he had ever read. No, it was neither friend nor relative, but a reader. We almost said "just" a reader. But, readers are the closest friends we have even though we may not know them at all. If you missed that report on automation, better look it up. You'll learn what automation really means to your plant.

New ideas . . . Several articles in this issue present good original ideas. One shows how Douglas has applied a variation of the "lost wax" process to building plastic radomes (page 106). Another poses more of a problem than a solution, but it may start you toward finding the answer. Be sure to read the plea, "Wanted: improved anchoring method" on page 105.

Coming . . . *AM* for Dec 16 features a Special Report on planning for capital investment that avoids complex formulas. Don't miss, "Planned facilities with built-in profits." The lead article will take you inside two plants where a missile is in mass production. You'll get some pointers on more economical gear inspection, on portable tools, on gun drills, and several other subjects.

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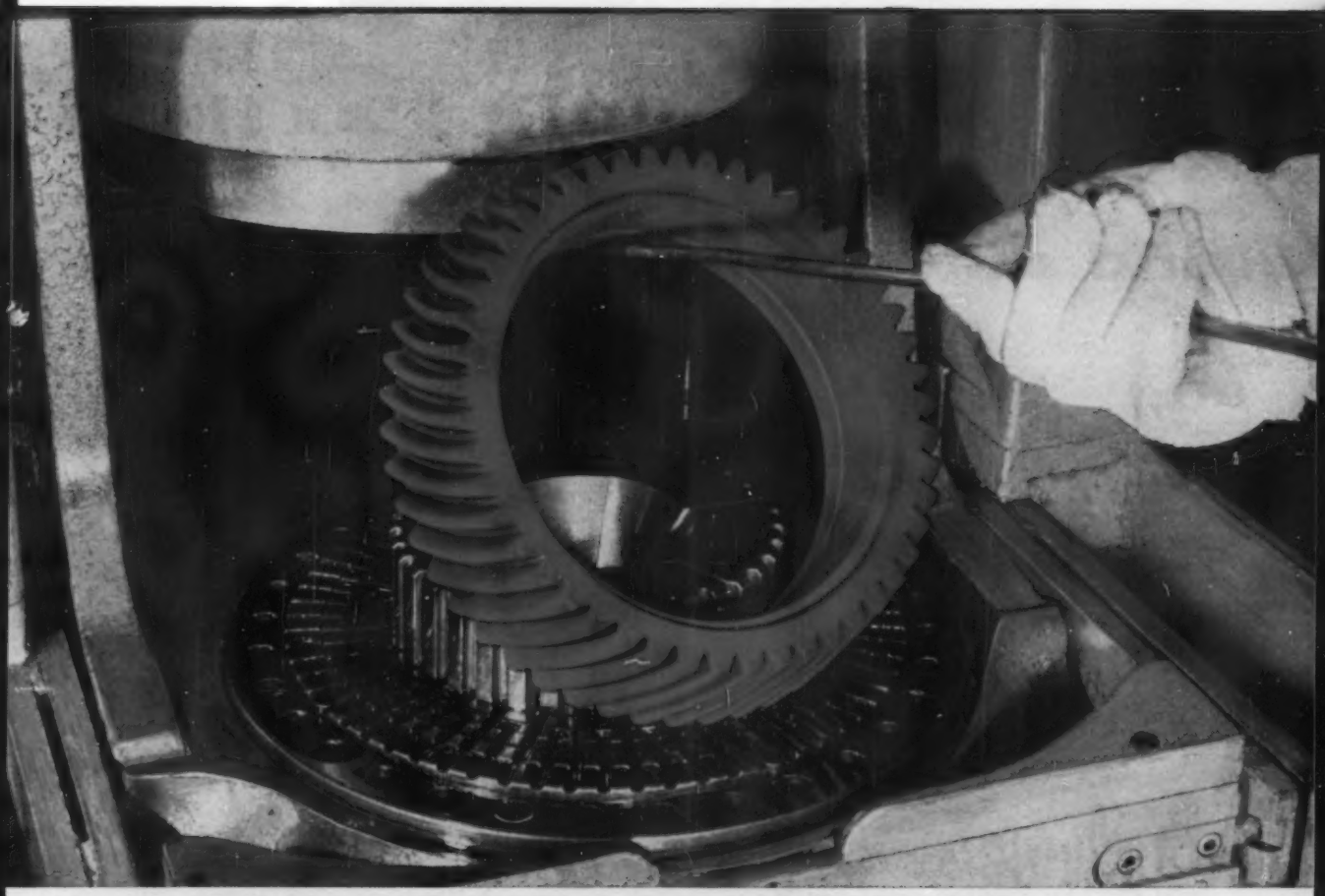

How to hold close tolerances when you quench gears and other parts

If you make parts like this aircraft transmission gear, you know that warpage or distortion during quenching means losing the time and money you've spent machining the part to close dimensional tolerances.

You can avoid such costly losses with Gleason Quenching Equipment.

The hot gear above, for example, is being set on the lower die of a Gleason Quenching Press. A button is pressed and the automatic quenching cycle is started. The lower die is swung back into the quenching position and the upper die descends rapidly, aligning the part while it is still in the plastic state.

The dies securely clamp the gear, but are so designed to permit it to contract in the normal manner, while still holding the gear true.

Carefully controlled metallurgically correct oil circulation hardens the gear to perfection.

Post-quench tests show the gear meets all specifications.

You can give *any* part, regardless of shape, the same distortion-free quenching.

Three sizes of the Gleason Quenching Press harden parts up to 36″ diameter. Another press automatically hardens and straightens shafts and shaft parts up to 40″ in length.

For literature and recommendations on the press and die equipment that fit your products, send us blueprints.

The Gleason Quenching Press forces oil uniformly over and around the part, assuring the correct hardness and distortion-free quenching.

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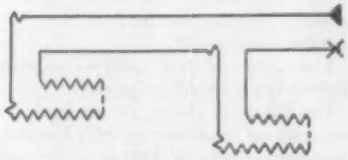
Powermatic with Duplex Head and automatic under and over cycle

mills 4 Counterweight Pads on Crankshafts

Machining operations on crankshafts are always special problems. Consider the four counterweight pads, for example, and the several methods by which they could be machined. Until now all were too slow. Cincinnati's Engineering Service specialists devised a unique short-cut method wherein the four pads are milled **under** and **over** in pairs, in one automatic cycle. A CINCINNATI® Powermatic Rise-and-Fall Milling Machine, equipped with a minimum of extras, handles the job efficiently and at the lowest cost. ¶A duplex spindle attachment takes care of the pads on the off-side of the crankshaft. Two working heights of the spindle carrier, required to mill two pairs of pads, are controlled by a modified standard attachment. The entire cycle, diagramed below, is controlled by a simple cycle selector, actually a small cam assembly interchangeable with standard Powermatic cycle selectors in a minute or two. ¶CINCINNATI Milling Machines and Engineering Service have put hundreds of difficult and unusual milling operations on the road to lower cost. This world-renowned team of fine milling machines and experienced production specialists can do as much for you. Just tell us about your machining problems related to milling and broaching; we will work out the solution.

Special Machine Tool Division

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



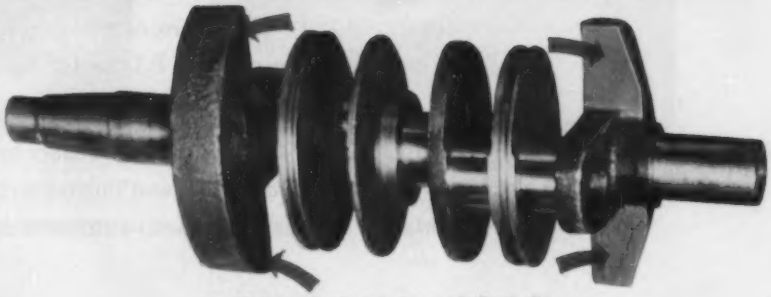
"Under and over" cycle incorporated in CINCINNATI Powermatic Milling Machine, to mill four counterweight pads on crankshaft. This cycle greatly simplifies tooling.

POWERMATIC MILLING MACHINE
Catalog M-1913-2

CIN

SPECIAL MACHINE TOOLS AND

Four crankshaft counterweight pads are automatically milled in one cycle on this CINCINNATI equipped Powermatic Milling Machine. The fixture is constructed in three sections to accommodate two sizes of crankshafts.



Photograph of part. Arrows indicate the counterweight pads.

Production data:

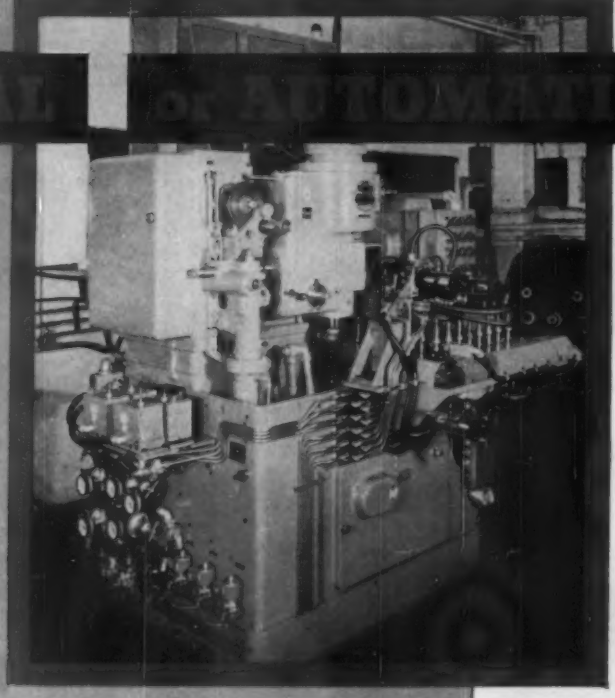
Part name . . . . . crankshaft
Material . . . . . steel forging
Operation . . . . . mill four counterweight pads
Estimated production . 32 per hour at 80% efficiency

CINNATI

COMPLETE PRODUCTION LINES

VERSATILE

MANUAL OR AUTOMATIC



Practically any shaped part in its size range can be cut faster and more accurately on a Fellows No. 4GS Gear Shaper . . . with either manual, semi-automatic or full-automatic operation, depending on your needs!

This production flexibility makes the powerful "4GS" ideal for long runs on similar parts or for short runs of varied jobs. Set-ups are easy and fast. Internal or external spur and helical gears, as well as splines, cams and other irregular non-involute shapes up to 6" P.D. and 2" face width can be cut on this machine. Nine cutter speeds range from 98 to 635 strokes per minute.

The versatility of the "4GS" can very probably lower *your* cutting costs. A 71-page booklet, "The No. 4GS Gear Shaper," describes and illustrates the machine in full detail, including attachments for automatic and semi-automatic operation. Simply write for a copy.

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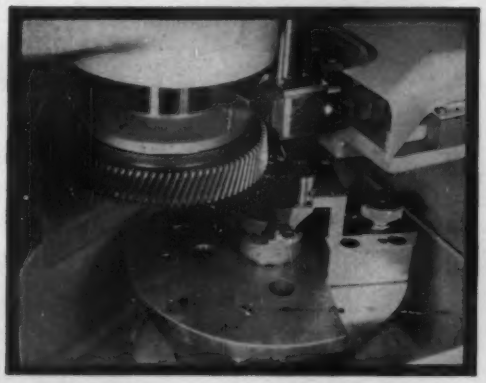
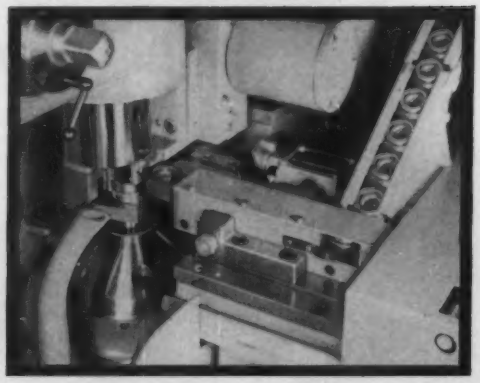
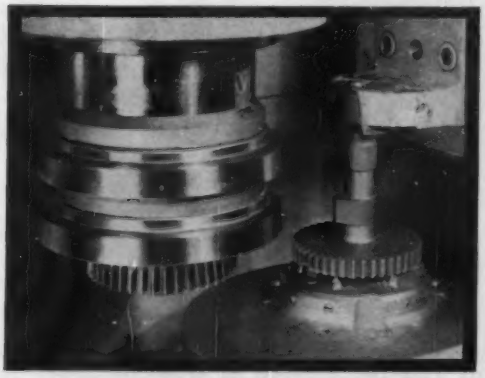


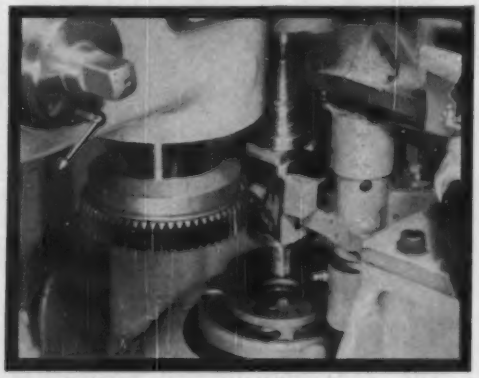
Helical gear cut on a motor crankshaft. Operation can be manual or semi-automatic. Part is held in a bushing at the bottom, an air operated split sleeve support at the top and driven from the connecting rod bearing surface.



Internal clutch parts produced with fully automatic loading and unloading. Part is transferred from loading chute to air operated expanding arbor and teeth are cut. Part is then removed from arbor and transferred to unloading chute while another blank is being loaded.



Two cams and a gear are cut at the same time on this gasoline motor part. Cutters are used in tandem and are keyed together to give the required relation between the positions of the cams and the teeth of the concentric gear. Operation is manual.



Automotive transmission cluster gear shaft handled automatically. Air operated "fingers" move shaft into position for automatic chucking and then place finished part in unloading conveyor.

Fellows *Gear Production Equipment*

Plunge and Traverse Grinding

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The Van Norman 418 Cylindrical Grinder is engineered to give you fast, accurate, low-cost plunge and traverse — small parts grinding, particularly if you have small or medium sized runs.

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Grinding wheel: 14″ O.D. x 2″ wide
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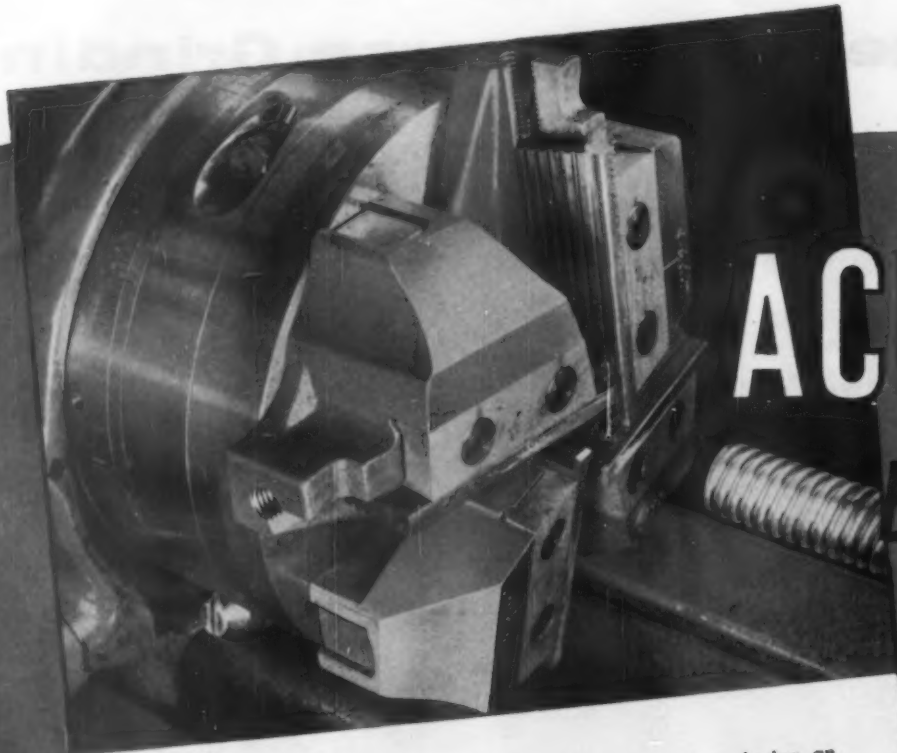


ACME Better

A LANDMACO Threading Machine is today playing an important part in the production of top-quality stainless steel valves at The Cooper Alloy Foundry Co. in Hillside, New Jersey.

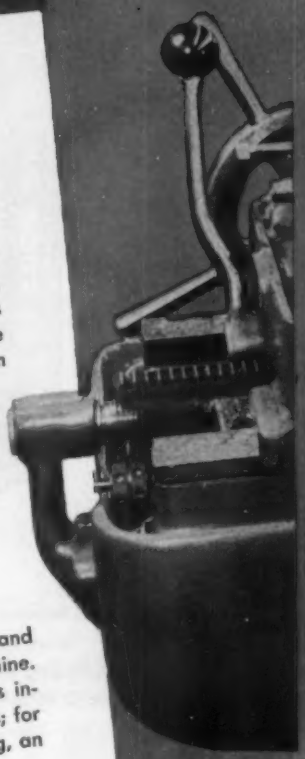
One operation, illustrated here, involves cutting ¼" pitch ½" lead Acme threads on 1⅝" diameter 304, 316, and 347 stainless steel valve stems. Both thread finish and concentricity are improved over previous threading methods, important factors in meeting the rigid quality standards for "certified" Cooper Alloy valves. IN ADDITION, large production savings are being realized. Each valve stem is threaded with a full 15⅞" thread in 2.5 minutes floor-to-floor time—as against 204 minutes by the previous method. Large savings are also being made in set-up time and in tool cost.

This operation is performed by a 2½" LANDMACO Leadscrew Machine equipped with a 2½" R LANCO Head using roughing and finishing chasers with centering throats. These chasers eliminate the out-of-round condition so common in long workpieces and produce coarse pitch threads of excellent finish in one pass.

Other valve stems, requiring left-hand, right-hand, double-start, and single-start threads, are also produced on this same LANDMACO Machine. These threads range from ⅜" to 1⅝" in diameter, and thread forms include both Acme and U.N. Tool cost is low in all of these operations; for example, when producing a ¾" 6 pitch single Acme thread 5⅛" long, an average of 500 pieces was threaded between chaser grinds.

This case history in just one plant illustrates the possibilities of the LANDMACO Threading Machine in Thread Production—a better quality thread, a lower thread cost, a greater versatility of production. Are there Threading Operations in your plant where these benefits might be realized?

Write for Bulletin H-75.



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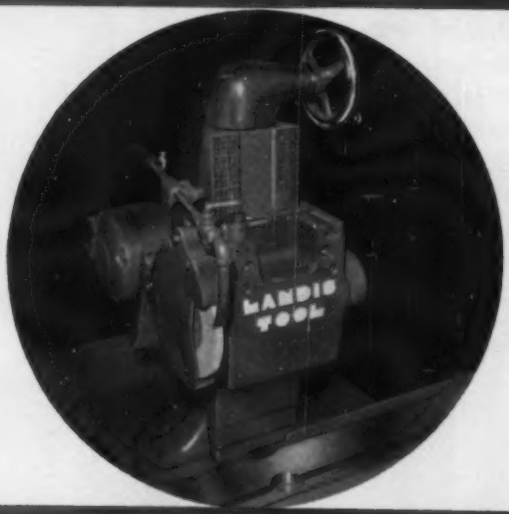
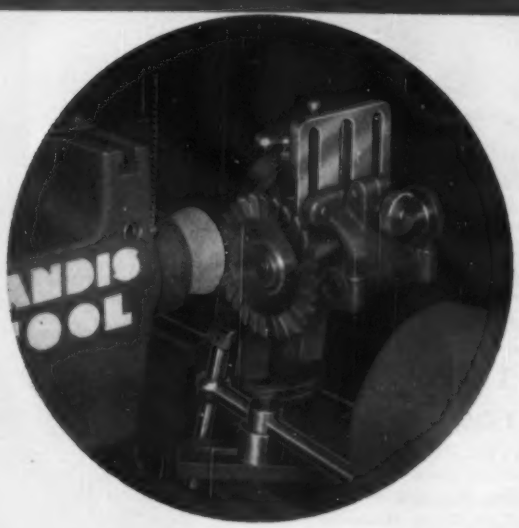
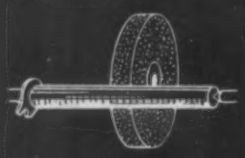


Rigid wheel head mounting on massive column adds stability for accuracy and fine finishes. Vertical ways for wheel height movement protected by telescoping covers below wheel head.

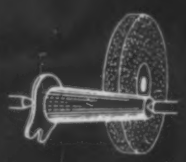


Tool sharpening . . . a wide variety of tools and cutters can be sharpened with standard and extra equipment.

grinding operations with standard equipment



cylindrical



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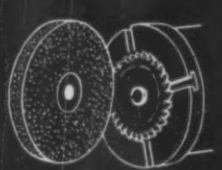
surface

tooth sharpening



face

spiral mill

Machining for profit with Giddings & Lewis

At Builders Providence Inc., a division of B.I.F. Industries Inc., Providence, R.I.

2 G&L's precision machine cast iron butterfly valve bodies 16 hours a day!

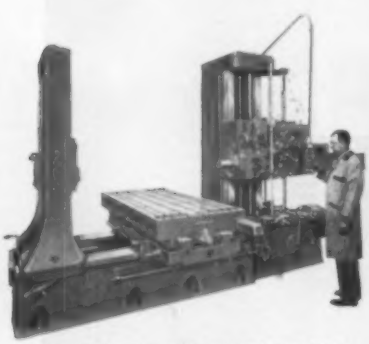
Producing at full tilt, 16 hours a day, these G&L's precision bore, face and mill on a line of tight-closing, rubber-seated, close-grain cast iron butterfly valve bodies ranging in diameter sizes up to 48 inches.

First Machine: 6-ft. HYPRO Vertical boring and turning mill precision bores the valve seat surfaces.

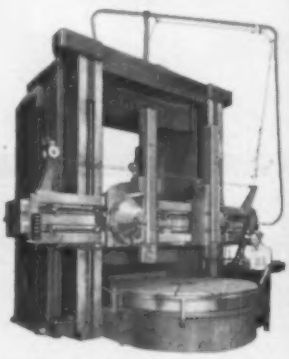
Second Machine: Model 340-T (table-type) horizontal boring, drilling and milling machine with 4" dia., spindle mills the mounting bosses, precision bores the stuffing gland and valve shaft diameters — *in a single setup!*

For complete information and specifications on these machines, contact your nearest Giddings & Lewis representative, or write direct for complete descriptive Bulletins Nos. 30-T (30 Series Horizontals) and 54-12 (HYPRO Vertical boring and turning mills).

Giddings & Lewis 6-ft. Vertical boring and turning mill faces top flange of a 30-inch, tight-closing, rubber-seated, close-grain cast iron butterfly valve body.



Capacity-boosting optional equipment that extends the normal working range of G&L 30-Series Horizontals includes angular milling attachment, continuous feed facing head, automatic electric-operating positioning device for headstock and table, Dupli-Tracer for 2 or 3-dimensional contour tracing and 360° profiling.

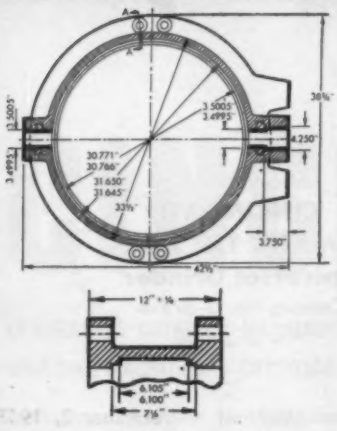


Available in 12 standard models, G&L HYPRO vertical boring and turning mills are offered with table diameters ranging from 54" to 12' and table work load capacities up to 125 tons . . . motor drives up to 100 hp. plus a wide range of optional features and equipment.

Rough and semi-finish and finish boring operations using Davis expandable two-cutter block boring bars are performed on this versatile G&L Model 340-T (table-type) Horizontal. It is equipped with a G&L combination plain, hand and power feed 60" rotary table for fast, accurate indexing of butterfly valve body without changing setup. In addition, Builders Providence Inc., uses the Model 340-T for milling the mounting bosses and stuffing gland face.

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.



Section A-A

Butterfly valve body machining sequence

...on Model 340-T Horizontal

- Precision-mill four integral mounting bosses for the valve operator bracket and also stuffing gland face using an 8-inch, 10-tooth, cemented carbide face mill cutter.
- Rough, semi-finish and finish bore 4.250″ dia., 3.750″ deep stuffing gland bore; rough and finish bore 3.5005″ dia. bore within .010″ tolerance for valve shaft.

...on 6ft. HYPRO Vertical boring mill

- Rough and finish turn top and bottom flanges... finish to 12″, plus or minus .125″, from top to bottom flange surface.
- Rough and finish bore inside of flanges to 30.000″ within .005″ tolerance.
- Rough and finish bore inside diameters 30.771″ and 31.650″ to 6.105″ deep within .005″ tolerance.

G-82

FILMATIC

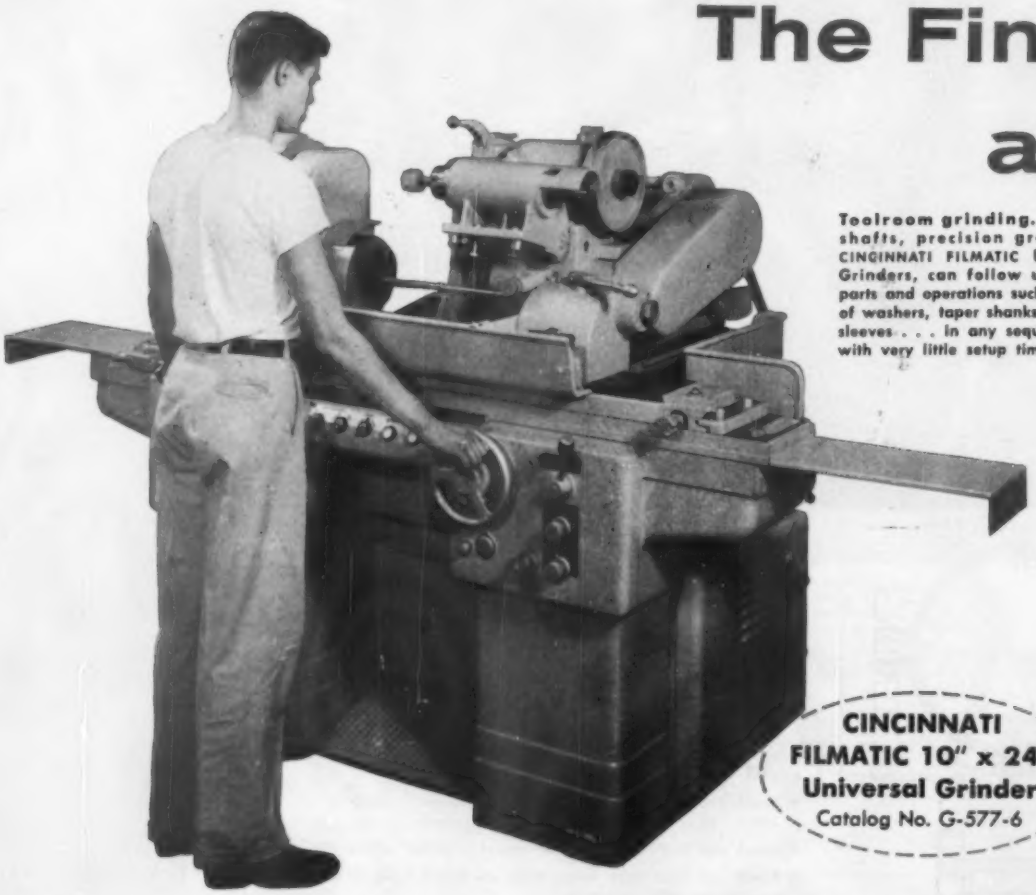
Look at your universal grinders from this viewpoint: when the need arises, can they handle big quantities at the low cost expected of high production equipment? It's routine work for the CINCINNATI® FILMATIC 10" Universals illustrated here. In addition to an unusual degree of versatility, these machines are equipped for automatic infeed grinding. For this type of work, a movement of one hand initiates the complete grinding cycle . . . rapid advance wheel to work, grind, tarry, return, and start and stop headstock rotation and coolant flow. ¶ The 10" Universal's extra measure of power is a big factor in both toolroom and low-cost production work. Consider these items compared to other machines in its class:

Largest grinding wheel: 12" diam. x 1½" face
Most powerful wheelhead motor: 2 hp
50% larger headstock motor
Exclusive FILMATIC grinding wheel spindle bearings

In addition to all these production advantages, the CINCINNATI is a true universal. Wheelhead swivels 180° and 220°, upper and lower, respectively; headstock swivels 180°; headstock speeds are infinitely variable 60 to 600 rpm. ¶ Want more information? Sweet's Machine Tool File contains brief specifications for the entire CINCINNATI FILMATIC line of fine universal grinders. For complete data, write for catalogs.

CINCINNATI GRINDERS INCORPORATED CINCINNATI 9, OHIO

The Finest also



Toolroom grinding. Slender shafts, precision ground on CINCINNATI FILMATIC Universal Grinders, can follow unrelated parts and operations such as sides of washers, taper shanks, bores in sleeves . . . in any sequence and with very little setup time.

CINCINNATI FILMATIC 10" x 24" Universal Grinder
Catalog No. G-577-6

Low-cost production grinding, on CINCINNATI FILMATIC 10" Universal Grinders equipped for automatic infeed work. These machines are also equipped with Draw-in Collet Attachment for Headstock. Other production equipment available includes Automatic Gap Eliminator and Automatic Air-Electric Gage Sizing.

Universal Grinder handles production work

Automatic infeed grinding equipment greatly extends Production Range for Cincinnati Filmatic 10" Universals

CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

The "RIGHT COMBINATION" for every reinforced grinding wheel

. . . because Norton builds the "TOUCH of GOLD" into it

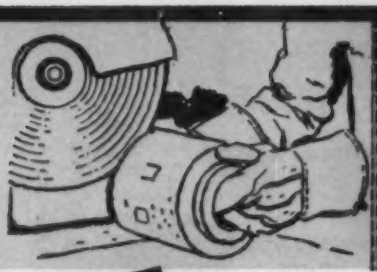
For every grinding, cutting-off or slotting job where you need a reinforced wheel, there's one Norton wheel that will do it best.

Norton helps you make more money by supplying a complete line of reinforced wheels. You get the size, the abrasive, the reinforcing web and the rubber or resinoid bond best suited to the work. Such a wheel puts the "Touch of Gold" in your hands for better production at lower costs.

. . . because Norton builds in Strength and Safety

These pages can't begin to show the many combinations to be found in Norton Reinforced Wheels, mounted wheels and points and sticks.

Norton makes so many varieties you can enjoy the just-right combination you're after. This "combination" lets you work fastest . . . safest . . . and most profitably. It's your advantage in dealing with the world's largest supplier of abrasives.



NEW

RN WHEELS
Glass Cloth

New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.

BN WHEELS
Glass Cloth

Ten inch diameter wheels can now be had 1/16" and 3/32" thick. In this range specify A36TBN. For heavy duty work, requiring larger, thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non metallic materials.

BD WHEELS
Glass-Nylon

For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.

BFR WHEELS
Cotton-Nylon

Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing, minor cut-off jobs, etc.

BF WHEELS
Cotton

These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.

W-1809

Also, Reinforced Mounted Wheels and Sticks

See your Norton distributor for further facts about reinforced abrasive products. Ask him for Booklet No. 1748. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cut Tapes

THE

A B C

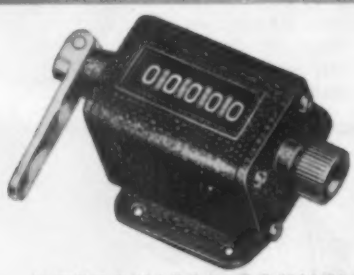
OF

1 2 3

Why is COUNTROL

important in every business today?

Countless times a day, every business needs to know "how many? . . . how much? . . . how far? . . ." and many other questions that can be answered only by facts-in-figures. But how to get these figures . . . from so many different machines, processes, operations and systems? Veeder-Root Counters are doing it every day, by means of:



MECHANICAL COUNTING

Small Resets count strokes, turns, or pieces . . . are used by thousands for moderate duty in parts inspection, quality control, conveyors, machine tools, light presses, etc.

HAND COUNTING

Where objects or units cannot be counted electrically or mechanically, hand-operated counters like this Hand Tally do the job. For instance, quick spot checks of production or performance, traffic count, inventory, etc. Fits palm of hand, counts one for each pressure of thumb lever, resets to zero by turning knob.

Insist on Standard

VEEDER-ROOT COUNTERS

from your Industrial Supply Distributor

ELECTRICAL COUNTING

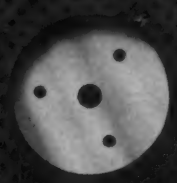
These remote-indicating counters bring your production machines as close as your office wall. AC or DC, they can be connected in series with any simple switch, and will transmit production figures *instantly* over any distance. May be panel-mounted in groups.

CONTROLLING

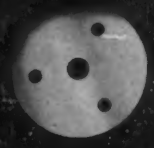
Set it for the exact number of turns, pieces, or operations required . . . and this Predetermining Counter will control the run *exactly* . . . preventing over-runs and shortages. When the predetermined number is reached, counter will light a light, ring a bell, or actuate a stop-motion.

IN SUM: *If it can be counted or controlled . . . count on Veeder-Root to do it. Get in touch with your Industrial Supply Distributor for standard counters for application to your production machines and processes. And get in touch with Veeder-Root for counters to be built into original equipment.* **Veeder-Root Inc., Hartford 2, Connecticut.**

The right disc *surface* can *lower* your abrasive costs!



Deep corrugated for fast, cool cutting: small, medium and large corrugations



Smooth face for general purpose grinding: small areas, fine finishes

Two grades to maintain disc flatness on heavy shear cuts

Radial lines for better coolant distribution

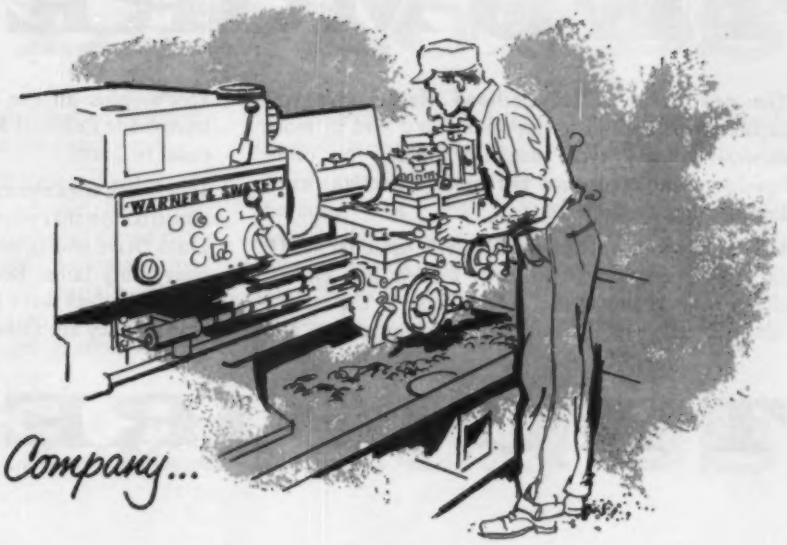
there's a Gardner Disc Surface to fit every job . . .

Combination for special applications

GARDNER

abrasive discs

BELOIT WISCONSIN



At Emil J. Paidar Company...

Equipment Modernization Program Pays Off

• Features New Warner & Swasey No. 4 Ram Type Turret Lathe

• Eliminates Seven Obsolete Machines • Provides $12,000 Annual Direct Labor Savings

TO KEEP PACE with today's expanding economy, progressive small shop operators are taking a closer look at their existing production facilities. Many now realize that a sound replacement policy can pay off in increased production—and profits, too. They are able to stay competitive while maintaining, or even increasing, product quality.

A case in point is Chicago's Emil J. Paidar Co. This leading producer of barber equipment installed a new Warner & Swasey No. 4 Ram Type Turret Lathe as the "keystone" of their recent modernization program. With their existing Warner & Swasey 3-A Turret Lathe, it permitted handling of all turning work on hydraulic cylinders and stems (pistons) used in Paidar barber chairs.

THE RESULTS:

- Replaced seven machines (old turret lathes, engine lathes, boring machines).
- Reduced the number of operations performed on parts because of the new turret lathe's increased accuracy and versatility over the older equipment.
- Decreased handling time on parts, because all turning is now done on two machines instead of seven.
- Increased accuracy, improved quality of the product.
- Gave increased factory space by producing more work on fewer machines, occupying less space.
- And last, but not least, in addition to indirect savings from above items, a direct labor savings of $12,000 per year has also been realized.

Why not let a Warner & Swasey Field Engineer prepare a detailed analysis of your present turning equipment now —it costs you nothing, only a phone call or letter.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

You can produce it better, faster, for less... with a Warner & Swasey

TWO MORE* ALL

The new 21" and 24" LeBlond Regals give you capacity, speeds and horsepower you'd find in more expensive heavy type machines offered by other builders—and at one of the most attractive prices LeBlond has ever offered!

Here's the rundown. Standard 7½ HP, optional 10 HP for high speed ranges in both models (see chart); electric clutch and brake; feed reverse at the apron; heat-treated gears in head, quick-change box and apron—plus all the famous big-lathe features that have made LeBlond Regals production favorites from coast to coast.

Headstock uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16" heavy-duty lathe. Bed has hardened and ground replaceable steel ways like the ways on our larger machines. They are fitted according to the compensating

TWO MORE* ALL

New 21" and 24"

*This makes five new lathes introduced by LeBlond so far this year!

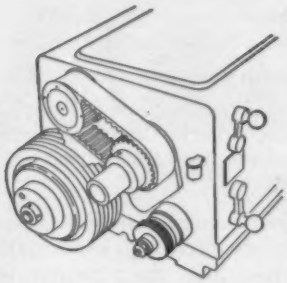
NEW LeBLONDS

veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.

Again, like higher-priced lathes, Regals are equipped with both feed rod and preloaded precision leadscrew for continued accuracy in thread chasing. Other big-lathe features— 3 bearing spindle. Automatically-lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. In addition, you get general dimensions and construction details patterned after LeBlond heavy-duty engine lathes.

All of LeBlond's 70 years of experience has gone into the design and building of these new Regals. Only from the builder of a complete line of lathes can you get a low-priced lathe with all these big-lathe features. Get full details on the new 21" and 24" LeBlond Regal Lathes. See your LeBlond Distributor or write—Ask for Bulletin R-205A.

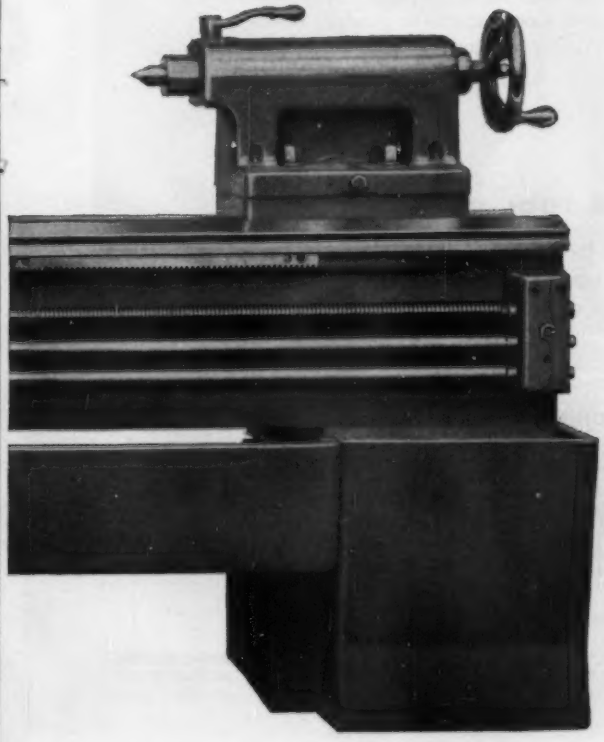
NEW LeBLONDS



Exclusive LeBlond

Combination Gear-Belt Drive

Regal lathes deliver up to 10 H.P.!



STANDARD AND OPTIONAL SPEED RANGES 21" and 24" REGALS	
12 Standard Speeds:	
Gear Drive	*18, 25, 35, 49, 70, 98, 136, 192 rpm.*
Belt Drive	*260, 362, 510, 720 rpm.*
12 Optional Speeds:	
Gear Drive	*27, 38, 53, 74, 105, 146, 204, 288 rpm.*
Belt Drive	*390, 544, 765, 1080 rpm.*

. . cut with confidence

THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

LeBLOND of Cincinnati

World's Largest Builder of A Complete Line of Lathes for More Than 70 Years

TIP-DOWN type* UNIVERSAL FIXTURES make possible the efficient production of CARBIDE TOOL HOLDERS

by LAPOINTE - BROACHING

Here's what one operator can accomplish, in broaching *all surfaces* of Carbide Tool Holders on this Lapointe Double-Ram Vertical Broaching Machine . . . *equipped with double Tip-Down* type Master Fixtures:*

Finish-Broach the complete shank rectangular contour, surfaces A, B, C, and D. (See Fig. 1)

Finish-broach the head contour, including both the lateral and back seats for the carbide inserts, the adjacent step, and the elevator round holes, previously drilled. (See Fig. 2)

Safe, convenient handling of parts is assured, because the hydraulically-operated fixtures are electrically interlocked in synchronism with the travel of the main machine rams; so that as one is broaching, the other ram is in position for loading. No delay, no idling time, no operator fatigue.

Production is up, costs are down, when broaching on this high-production Lapointe machine. Available in 10 sizes: 3- to 25-ton capacity, 48- to 90-inch stroke, it will enable you to go after business you couldn't get before, because of your more expensive production methods. Let a Lapointe Field Engineer show you how *easily* you can convert some of your present operations to broaching.

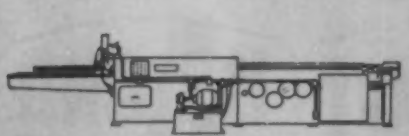
*LAPOINTE PATENT

THE LAPOINTE MACHINE TOOL COMPANY

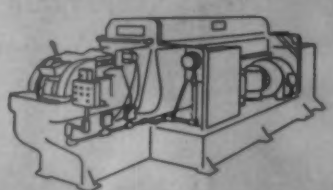
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

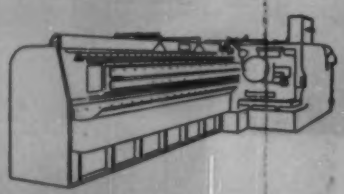
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

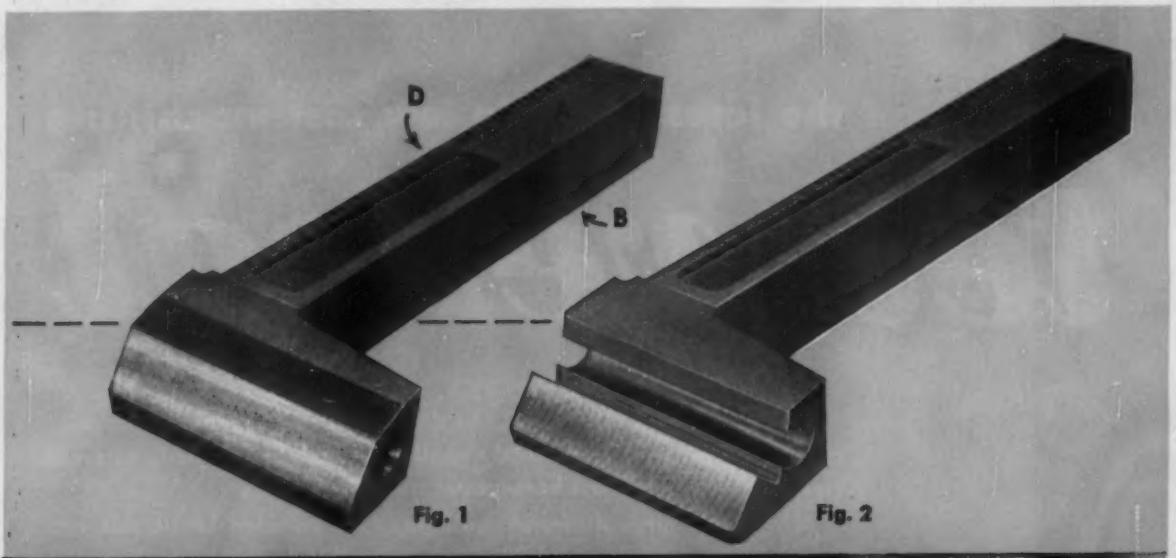
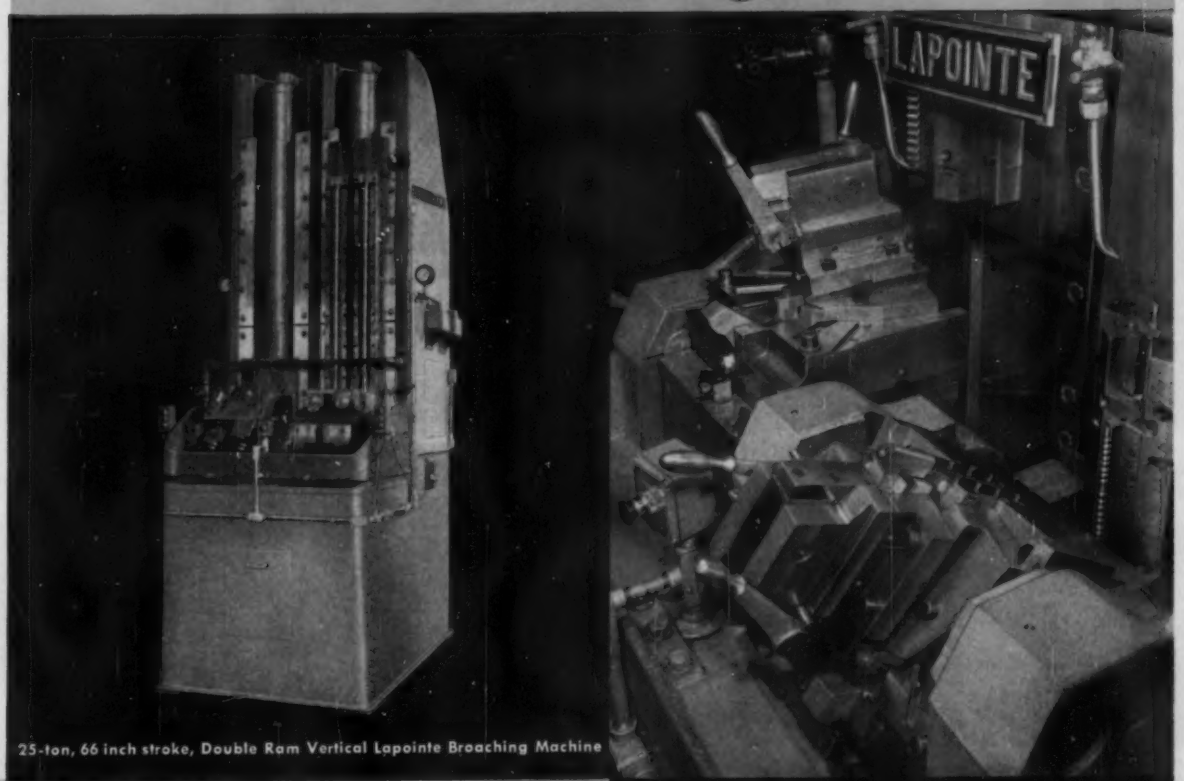
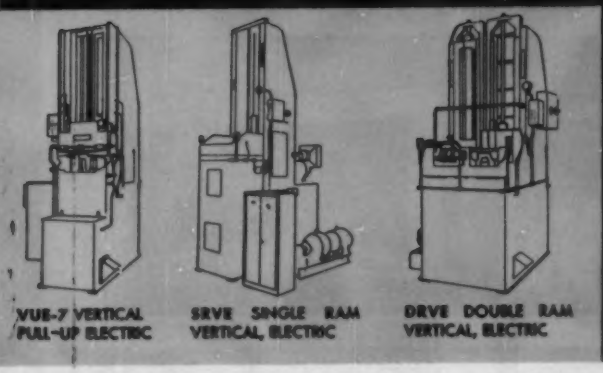


Fig. 1 Fig. 2



25-ton, 66 inch stroke, Double Ram Vertical Lapointe Broaching Machine



LAPOINTE

known to be the best in

BROACHING

the latest word in low cost machining

televersal

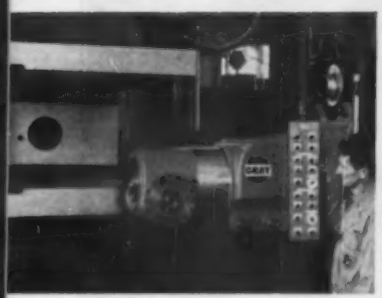
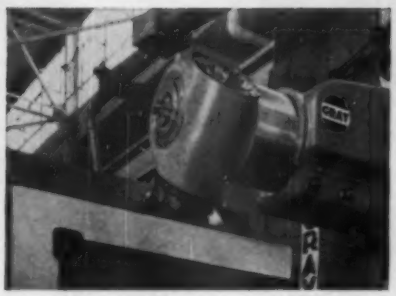
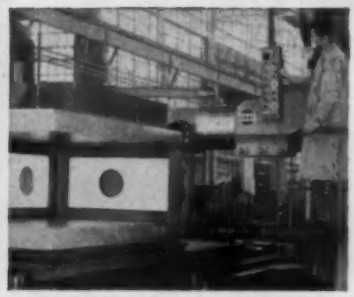
This new GRAY TELEVERSAL head tremendously increases machining range. Conveniently applied, quickly positioned, its great rigidity permits highest horsepower milling cuts.

The large diameter quill may be swiveled to permit any angular cut. A triple-straddle clamp inflexibly locks the quill to the cast pyramid body.

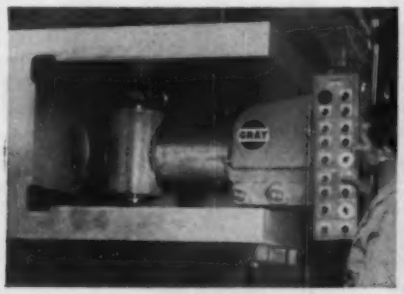
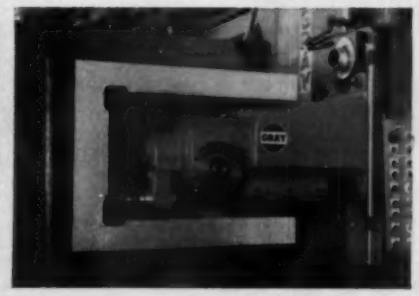
Designed to keep the job low and yet permit great machining range. Ideal when used with column cross travel of the new GRAY horizontal, boring, drilling and milling machine.

Not just an attachment, but a high power massively built, heavy milling unit that offers a new concept in versatility.

The G. A. GRAY Co., Cincinnati, Ohio

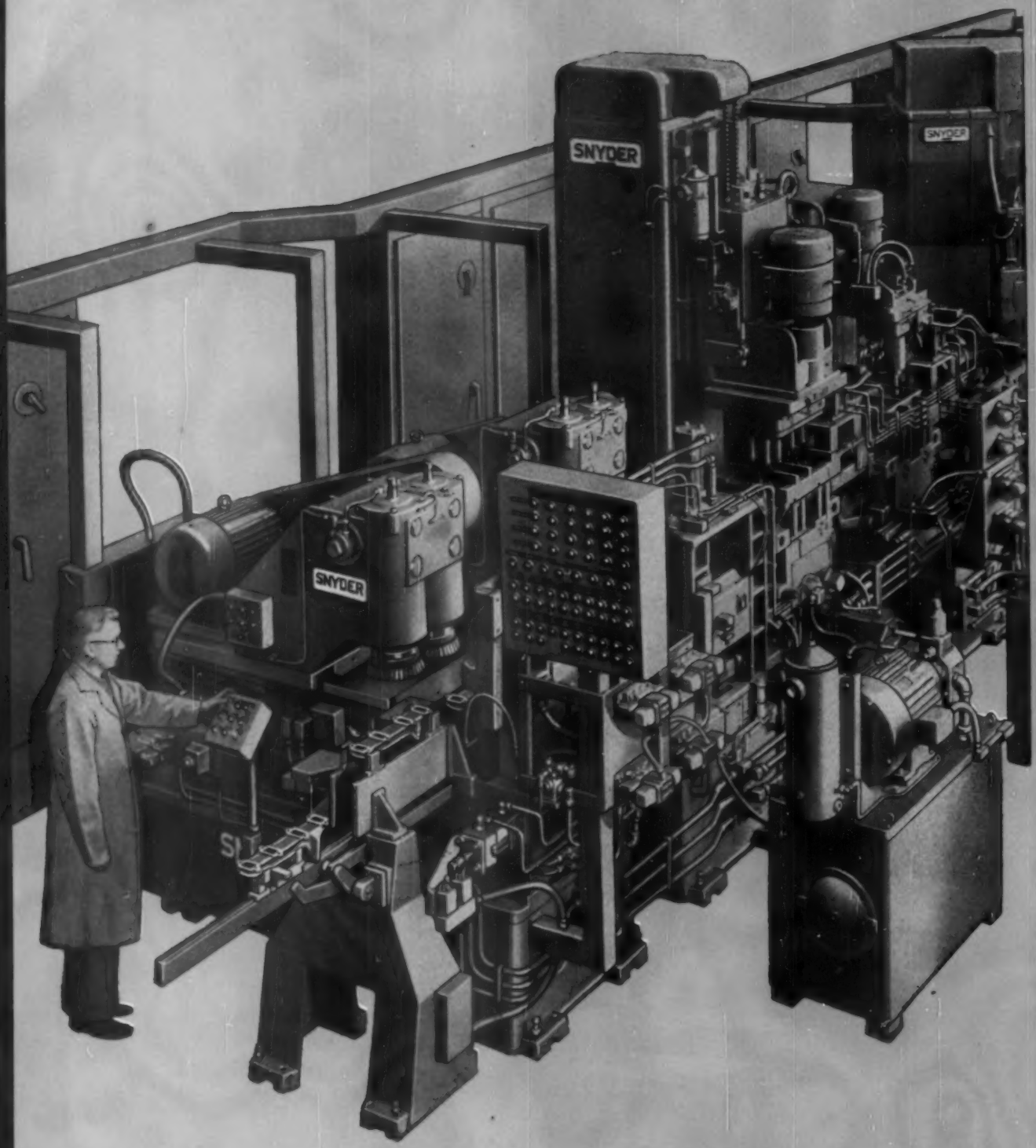




six different surfaces and more... and only ONE work-setting

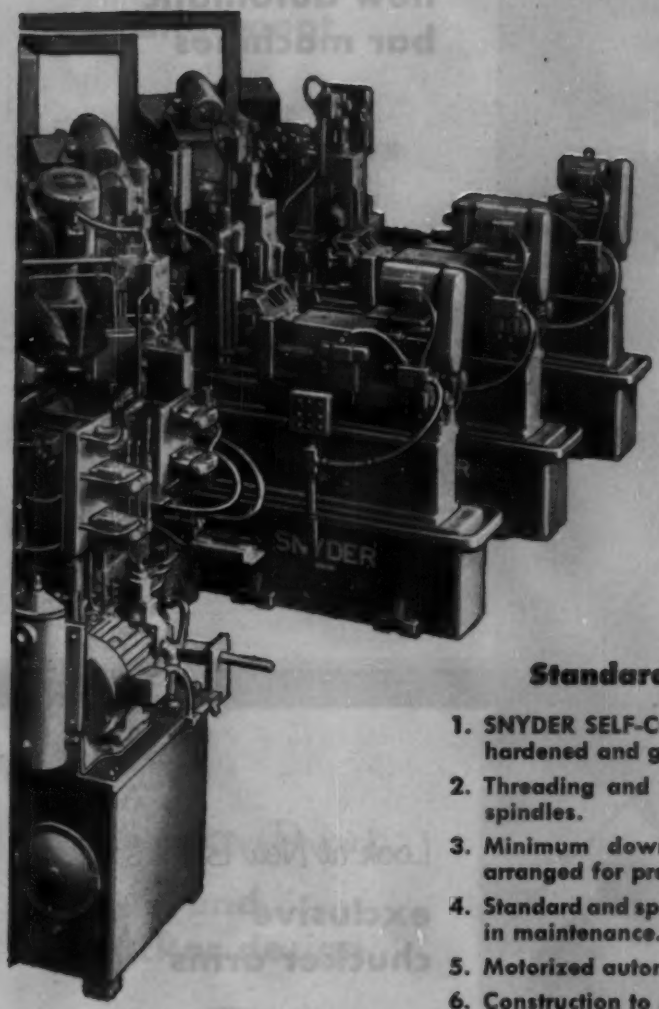



Simultaneously in Random Sequence

Two Different Exhaust Manifolds Processed by Snyder Special



Simultaneously in Random Sequence In-Line Transfer Machine



SPECIAL FEATURES

1. Production: 136 manifolds per hour.
2. 28 Stations: Operations include milling, drilling, chamfering, probing and tapping.
3. Manifolds "A" and "B", loaded at random, are identified by built-in sensing devices which activate or idle machining units at appropriate stations as required by the different parts. Parts "A" and "B" are identically processed at Stations 1, 4, 6, 7, 8, 9. At Stations 6, 7 and 9, sensing devices detect Part "B" and bring in automatic clamp support. Both parts are turned over at Station 12. Part "A" is processed at Stations 14, 16, 17, 18, 19. Part "B" is processed at Stations 22, 24, 25, 26, 27 and both parts are unloaded at Station 28 by automation equipment.
4. Individual base segments provide maximum flexibility for future part design changes.
5. Floor space: 63′ x 20′.

Standard Features of Snyder Machines

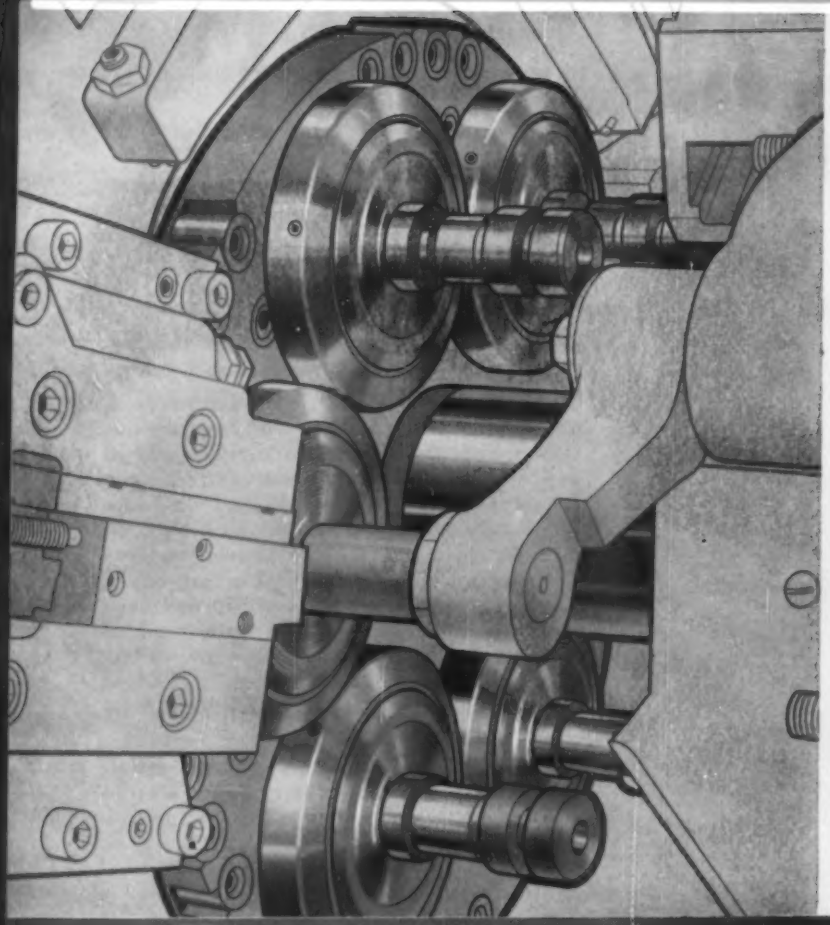
1. SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground ways.
2. Threading and tap heads equipped with individual lead-screw spindles.
3. Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
4. Standard and special parts interchangeable for speed and economy in maintenance.
5. Motorized automatic lubrication system for all moving parts.
6. Construction to J. I. C. Standards throughout.
7. Master Push Button Panel and Light Console at Station 1.
8. Each unit equipped with its own push button control station for ease of tool setup and manual operation of unit.
9. Electrical interlocks and full depth circuit throughout.
10. Panels equipped with SNYDER CIRCUIT SLEUTH.

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

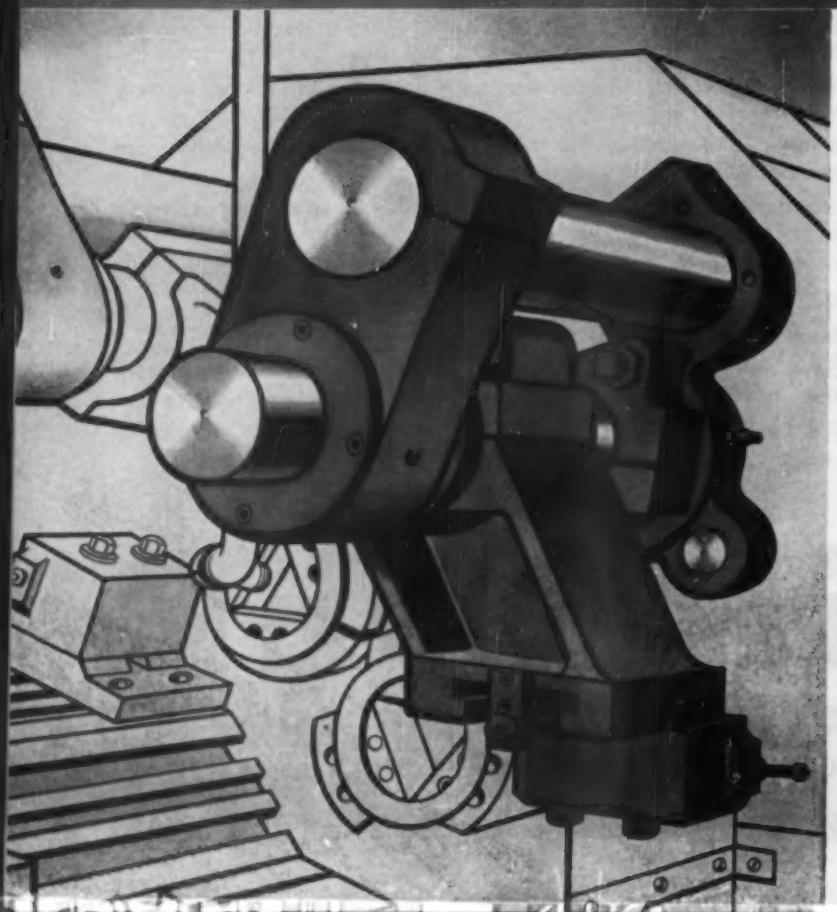
32 Years of Special Machine Tools with Automation



Look at New Britain's

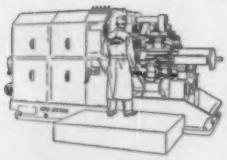
new automatic bar machines

The widest range of spindle speeds among machines of comparable capacity and accuracy.



Look at New Britain's

exclusive chucker arms

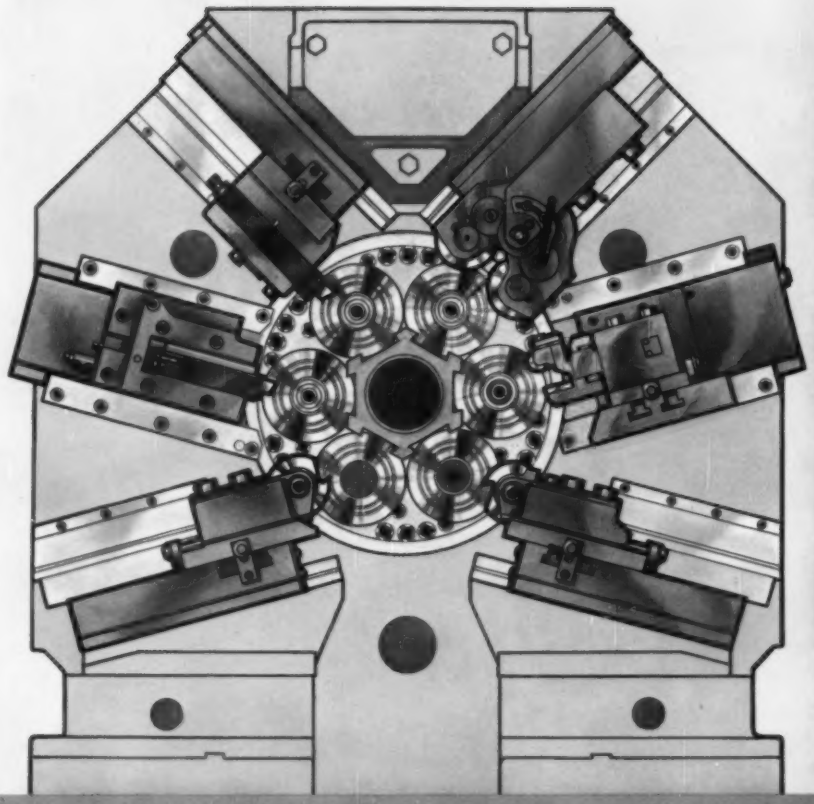


All the ruggedness of a cross slide, but with two-way motion for cutting O.D.'s, I.D.'s, tapers and radii and for recess boring, in addition to facing cuts. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Look at New Britain's

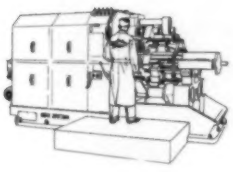
new cross slide arrangement

Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

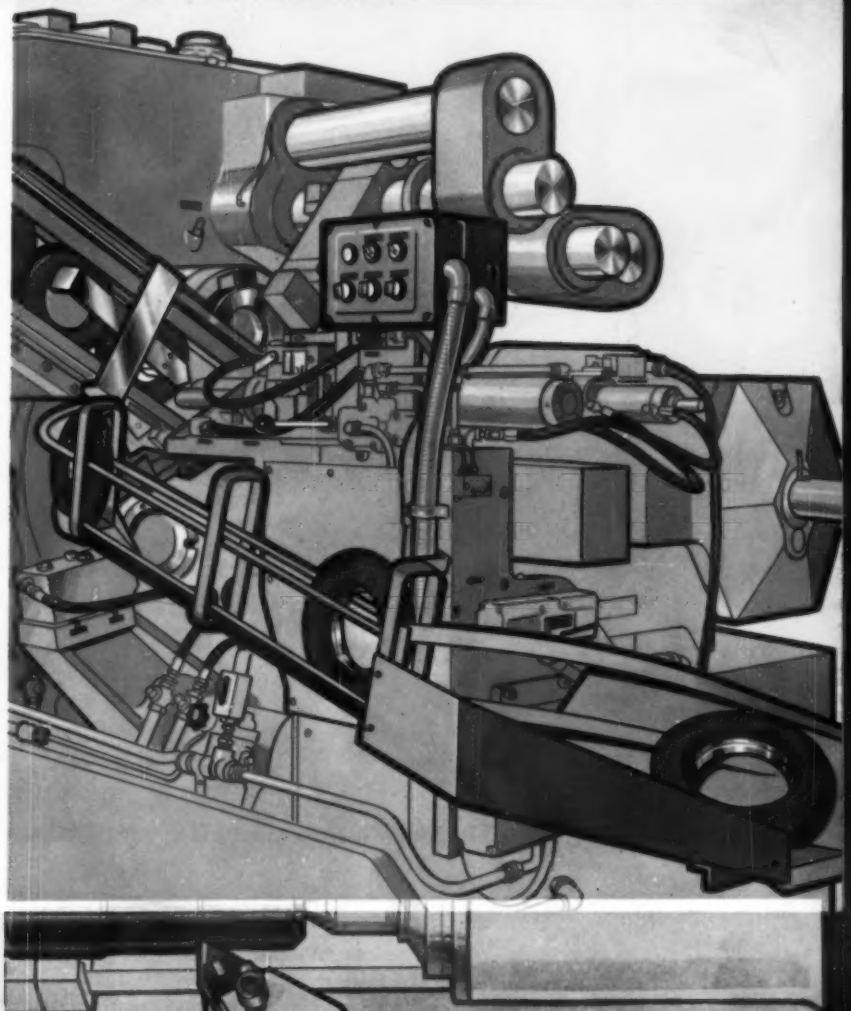


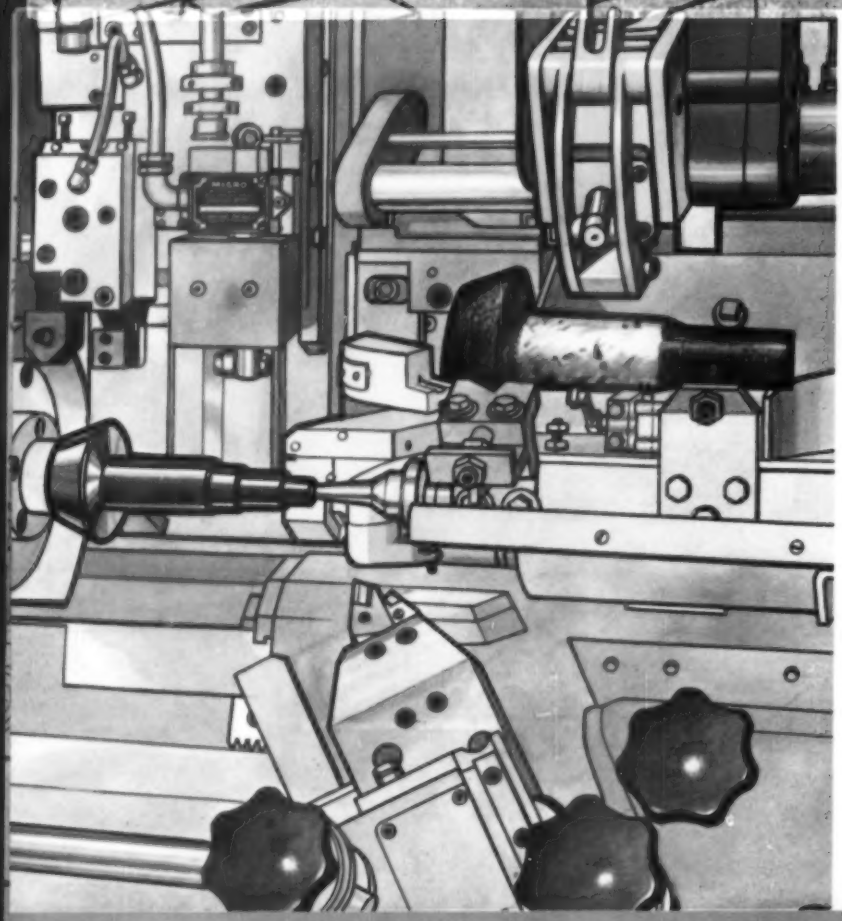
Look at New Britain's

open-end chucker design



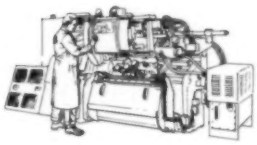
Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



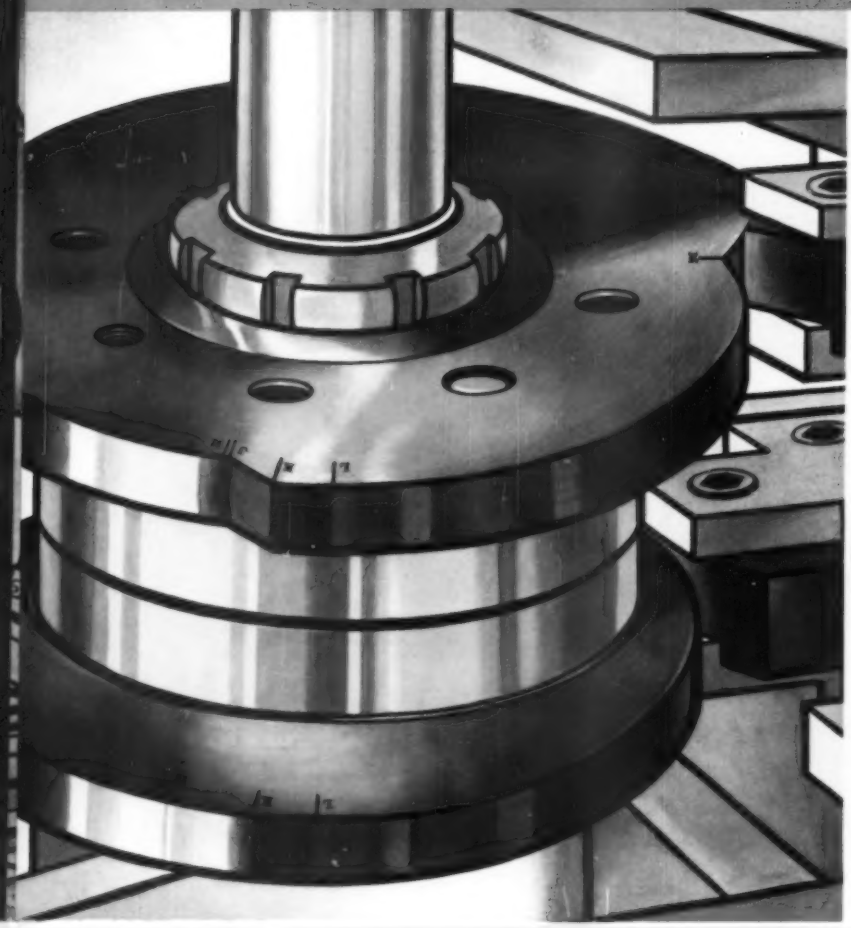


Look at
Automatic Loading on

New Britain +GF+



This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.



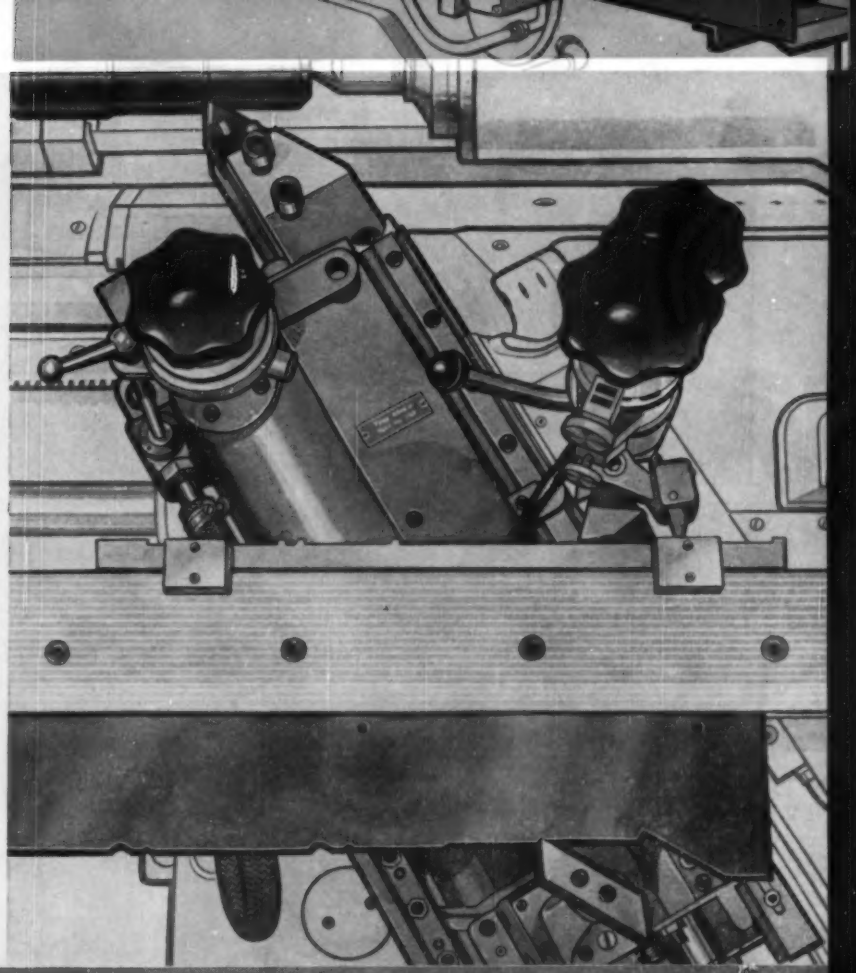
Look at New Britain's

cam-controlled boring machine

When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

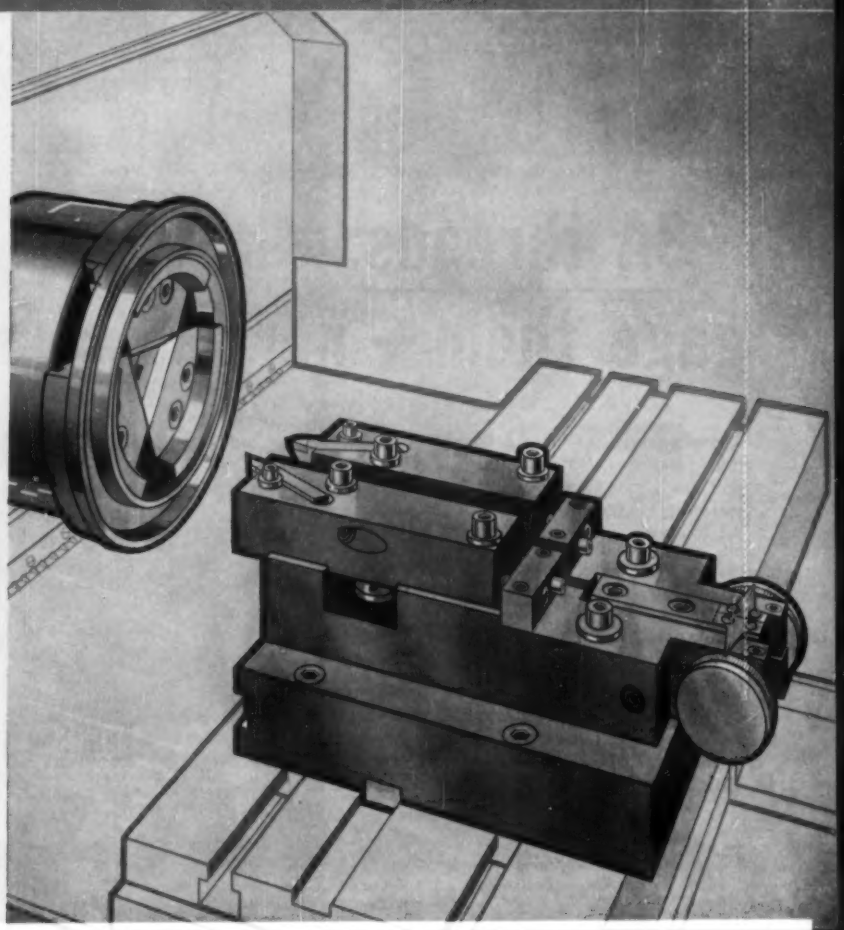
Look at
Single Point Tooling on
New Britain +GF+

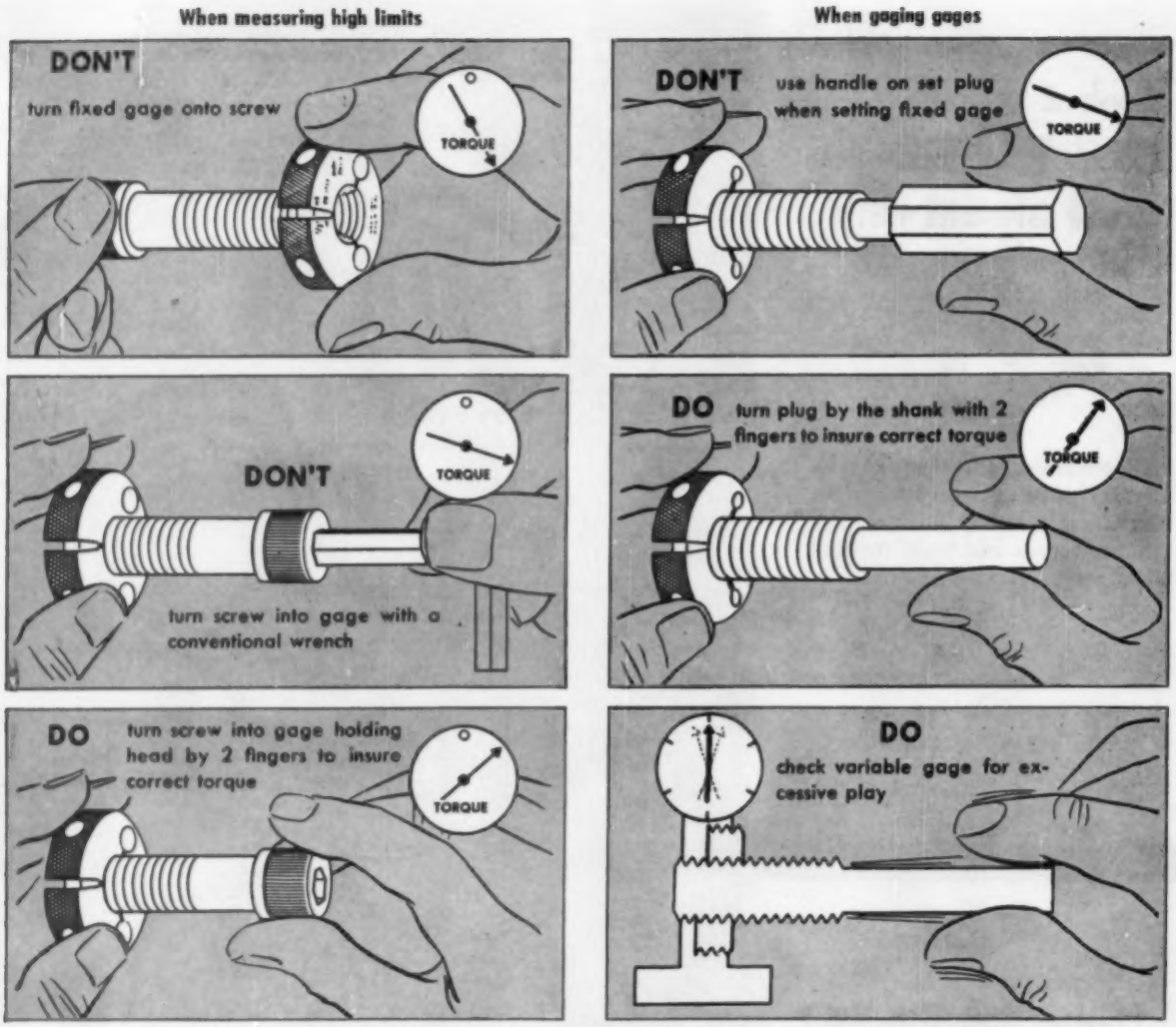
Outproduces gang tooling setups by reducing tool change time practically to zero, and by cutting at maximum speeds and feeds for tool efficiency.



Look at New Britain's
simple approach to problem pieces

Low cost per piece is inherent in New Britain Precision Boring Machines because of their simplicity, versatility, speed, repetitive accuracy and inexpensive tooling. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.





These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

Namco COLLAPSIBLE TAPS

FOR ROTATING OR STATIONARY-SPINDLE MACHINES

for smooth, clean thread form... fine fit... uninterrupted tapping... on long or short runs

POSITIVE PRECISION— Compact construction and unique core piece design assures rigid, full-length chaser support; heavy body supplies ample side support.

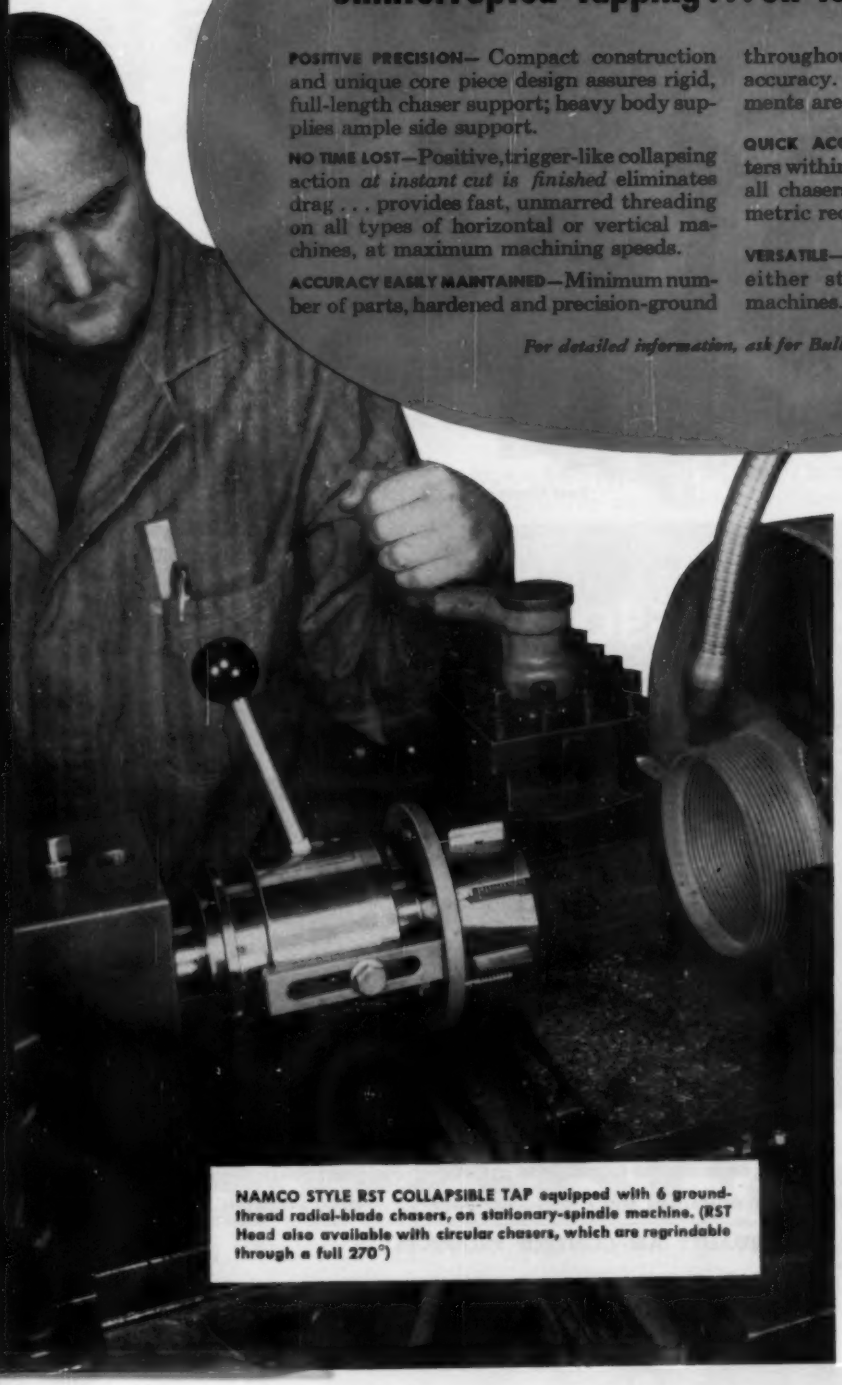
NO TIME LOST—Positive, trigger-like collapsing action *at instant cut is finished* eliminates drag . . . provides fast, unmarred threading on all types of horizontal or vertical machines, at maximum machining speeds.

ACCURACY EASILY MAINTAINED—Minimum number of parts, hardened and precision-ground throughout, assures less wear — greater accuracy. Less down time because replacements are fewer and easier.

QUICK ACCURATE ADJUSTMENT for all diameters within range of head. One screw adjusts all chasers, *simultaneously*, to precise diametric requirement.

VERSATILE—Same RST Head can be used on either stationary or revolving-spindle machines.

For detailed information, ask for Bulletin DT-52



NAMCO STYLE RST COLLAPSIBLE TAP equipped with 6 ground-thread radial-blade chasers, on stationary-spindle machine. (RST Head also available with circular chasers, which are regrindable through a full 270°)

A WIDE RANGE OF SIZES AND TYPES

Style RSA.— Solid, adjustable. Range 1¼" to 4".

Style RST.—With radial blade chasers. Range 1¼" to 4".

Style RST.—With circular chasers. Range 3" to 5"

Style RES-L. Range: With radial chasers, 2¾" to 4"; with circular chasers, 4½" to 13⅜".

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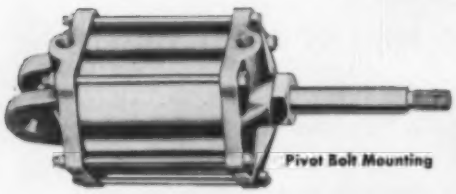
171 EAST 131ST ST., CLEVELAND 8, OHIO
SALES OFFICES: Newark, Chicago, Detroit

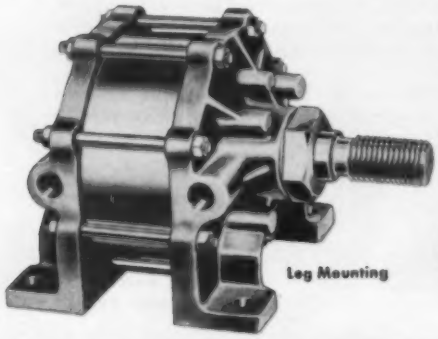
Schrader®...

your one source for AIR CYLINDERS

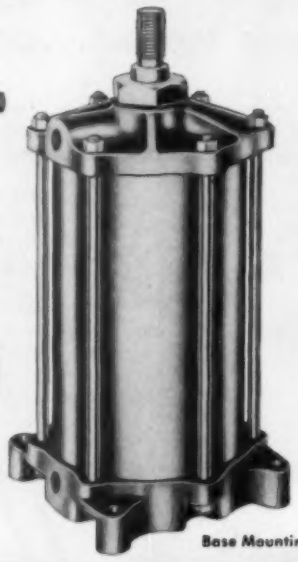
push, pull, single or double-acting, with or without cushion . . . for every type and mounting



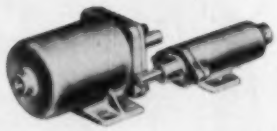
Pivot Bolt Mounting



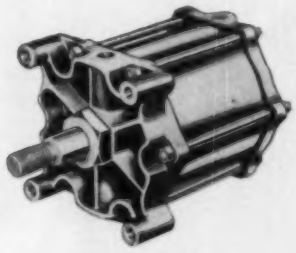
Leg Mounting



Base Mounting



Small Clamping Cylinders



Flush Mounting

Schrader
a division of SCOVILL

Available for immediate delivery from your Schrader Distributor

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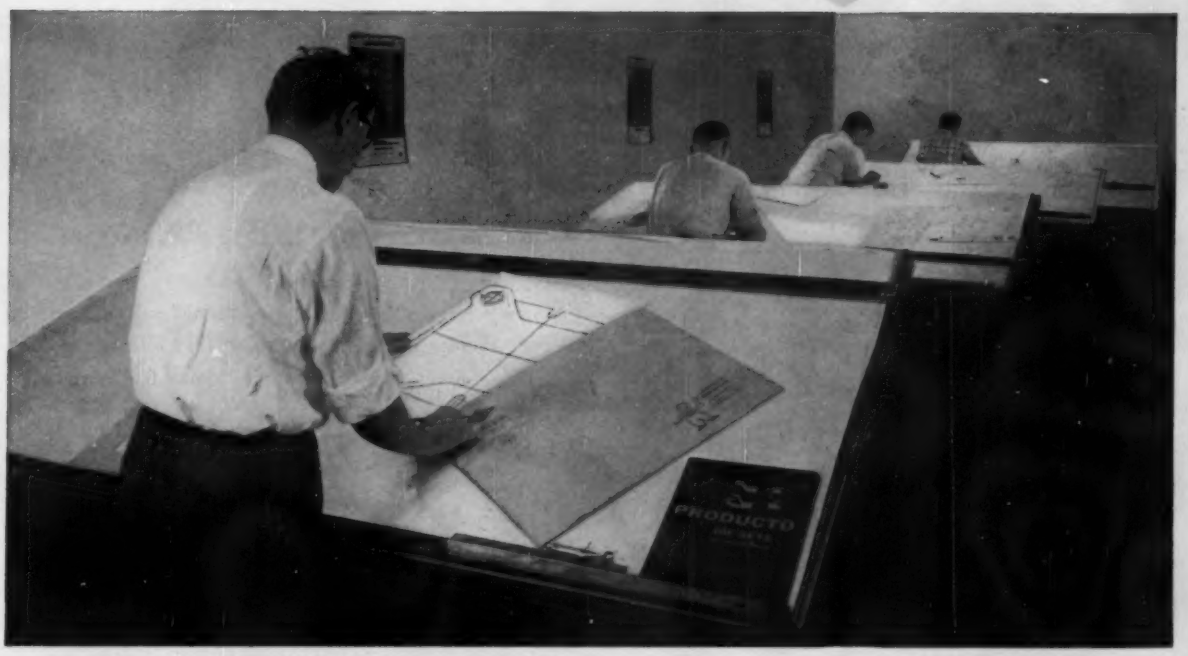
QUALITY AIR CONTROL PRODUCTS

Why the Die Designer Prefers PRODUCTO Die Sets



He can specify Producto with complete confidence

The die designer likes to specify Producto die sets on his blueprints because they are a nationally-accepted "brand." They're easy to get anywhere... and delivery is prompt.

He favors Producto because he knows he never has to compromise his die design. Even if the die layout is a little unusual, he will be able to select a die set to accommodate it from Producto's wide range of thicknesses and styles.

He also knows Producto has the equipment that can cut his tooling costs by letting him adapt his sets to a more economical *basic* design. Only Producto offers him complete foundry, pattern-making, welding and machining services for his special requirements.

The die designer recognizes Producto's Qwik-Fit Guide Pins as an important new feature that die makers want. He specifies them because they save up to 75% of the time normally required for die set assembly and disassembly.

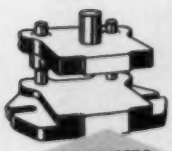
The die designer likes to use Producto's new catalog, the industry's most practical tool. His die layout is simplified when he uses Producto die set templates. And Producto provides him with cost-saving ideas in the DIE SET DIGEST.

Most important, he can depend on *consistent* Producto die set accuracy to transfer from the drawing board to the press the precision and ingenuity of his die design.

Yes, the designer has found that Producto die sets justify his confidence in specifying Producto. You will, too.

TWO FREE AIDS to more economical, efficient use of die sets are available from Producto. All-new CATALOG NO. 11 makes ordering and selection job easy. DIE SET DIGEST gives valuable tips for designers, builders and users of dies. Write for them today.

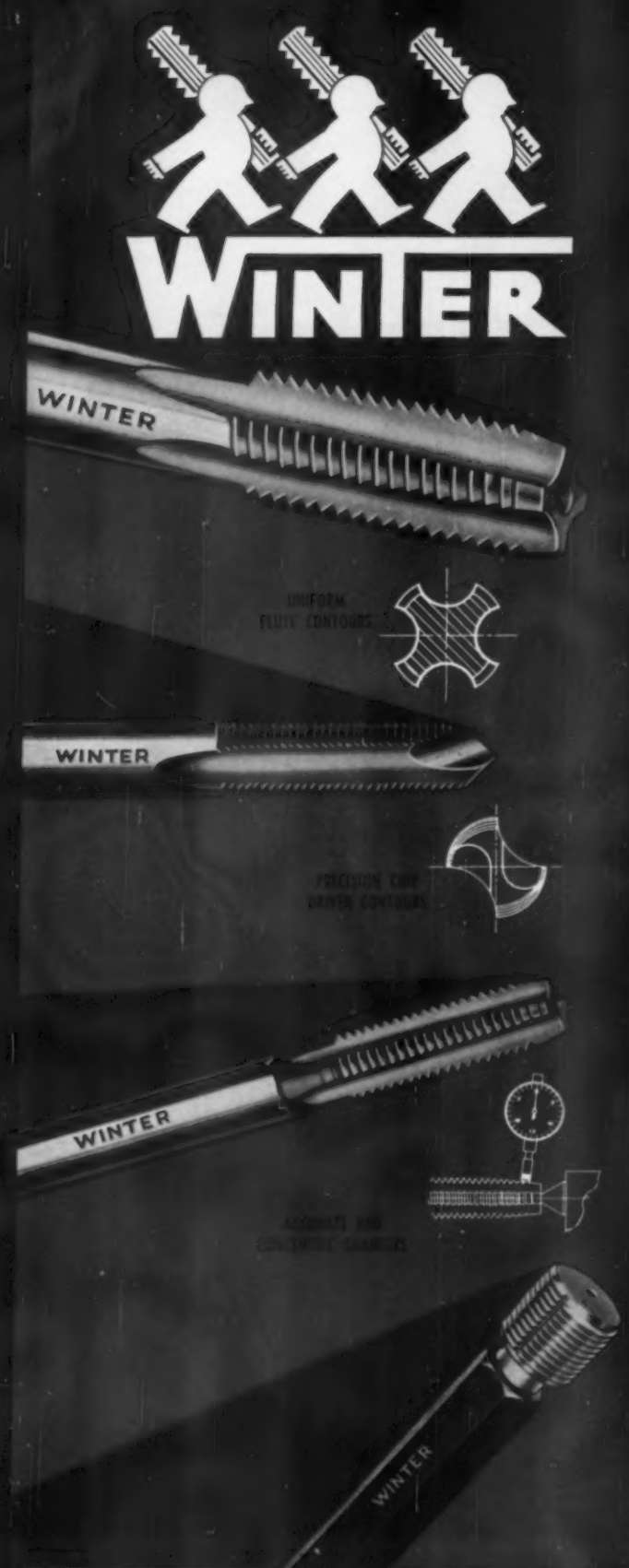
THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut



Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



BALANCED ACTION brings you lasting satisfaction with your tapping operations

When tool manufacturing is planned and carried through with extreme care, you get exceptional accuracy and long tool life. *Winter has proved this* through the steady year-to-year increase in users of Balanced Action Taps.

CALL YOUR WINTER DISTRIBUTOR

Flute spacing must be exact in a tap that performs with Balanced Action. This is the first of four craftsmanship qualities manufactured into every Winter Tap.

WINTER BROTHERS COMPANY
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Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles • Division of National Twist Drill & Tool Co.

A search that never ends

The quest for better ways to cut metals is continuous in National's testing laboratories. When worthwhile improvements are found, the benefits are made available to you through better performance of *National Tools.*

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

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CARBIDE AND SPECIAL TOOLS

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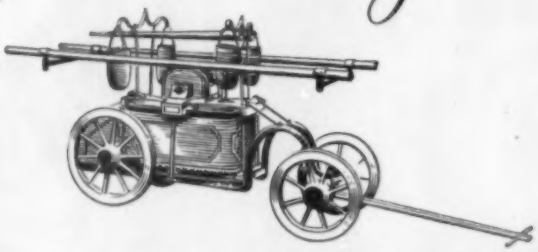
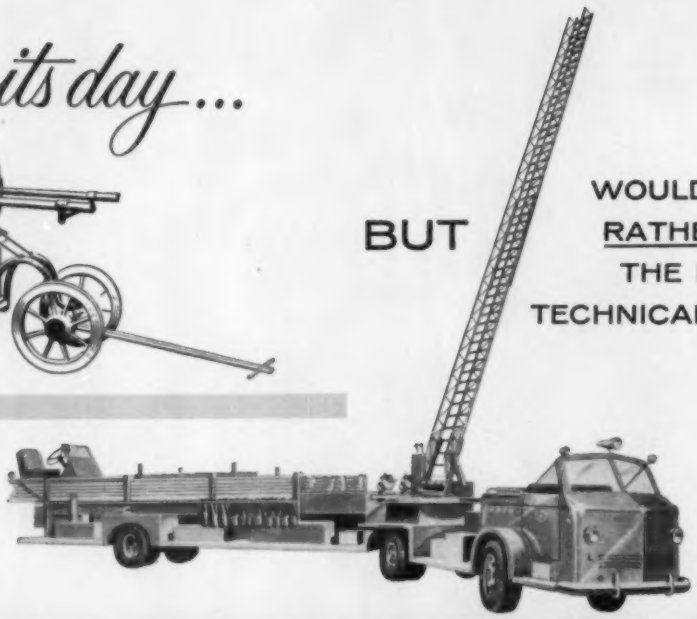


BUT

WOULDN'T YOU
RATHER HAVE
THE LATEST
TECHNICAL ADVANCE?



Now from **Heller** *A great new advance that lowers metal cutting costs*

HAND AND POWER

"Job Tempered" Hack Saw Blades

Certified by American Standards Testing Bureau* to meet their standards for superior cutting: Uniform Teeth, Uniform Set, Uniform Temper

Clean, efficient, *lowest cost* cutting can only be obtained from *uniform*, consistent quality blades such as produced by Heller's unique, Job Tempering process.

In Heller Job Tempered hand and power blades, uniformity begins right with the raw steel which is made to specification and minutely inspected for analysis and proper grain structure. Teeth are *milled* to uniform size, shape and spacing by the most modern, highly specialized equipment in the industry. Uniformity of tooth set is precisely measured with an indicator specifically developed for this purpose.

Then Heller's unique heat treating technique, *carefully matched to the metallurgy of the steel*, brings about exceptional uniformity of temper the full length of the blade — and from one blade to the next.

That's why *every* Job Tempered hand or power hack saw is certified by American Standards Testing Bureau to meet their standards for superior cutting: uniform teeth ... uniform set ... uniform temper — your assurance of outstandingly better, *lower cost* service on the job.

* AMERICAN STANDARDS TESTING BUREAU INC. ASTB

SOLD EXCLUSIVELY THROUGH

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"YOUR OUTSIDE TOOL ROOM"

SERVICE + STOCKS = SAVINGS

HELLER TOOL CO. SINCE 1856

Heller

HELLER TOOL CO., *America's Oldest File Manufacturer*
Newcomerstown, Ohio — A Subsidiary of Simonds Saw and Steel Co.

IT'S EASY to CHOOSE
EASY to USE
THE RIGHT
HELLER BLADE

FULL LINE OF HAND AND POWER BLADES

There's a right Job Tempered Blade for your hand frame or power hack saw in Heller's complete line.

HAND BLADES

Supplied in Standard Steel, High Speed "M"-Hax and High Speed "T"-Hax Steels. 10" and 12" lengths to fit all standard frames. Tooth spacings of 14, 18, 24, and 32 teeth per inch. Hard-Edge flexible blades for general use or the All-Hard preferred by skilled operators.

POWER BLADES

Available in High Speed "M"-Hax and "T"-Hax Steels and in "Nuweld" shatterproof type for maximum safety. Lengths from 12" to 36" for all machines. Tooth spacings 2½ to 18 teeth per inch for cutting most materials.

HOW TO SELECT AND USE THE RIGHT BLADE

Your Heller Distributor has handy Wall Selection Charts to help you choose the *right* blade for the job, and a valuable booklet, "Heller Hints on Hack Saws" that help you get long life, top performance and the lowest cutting costs you've ever experienced!

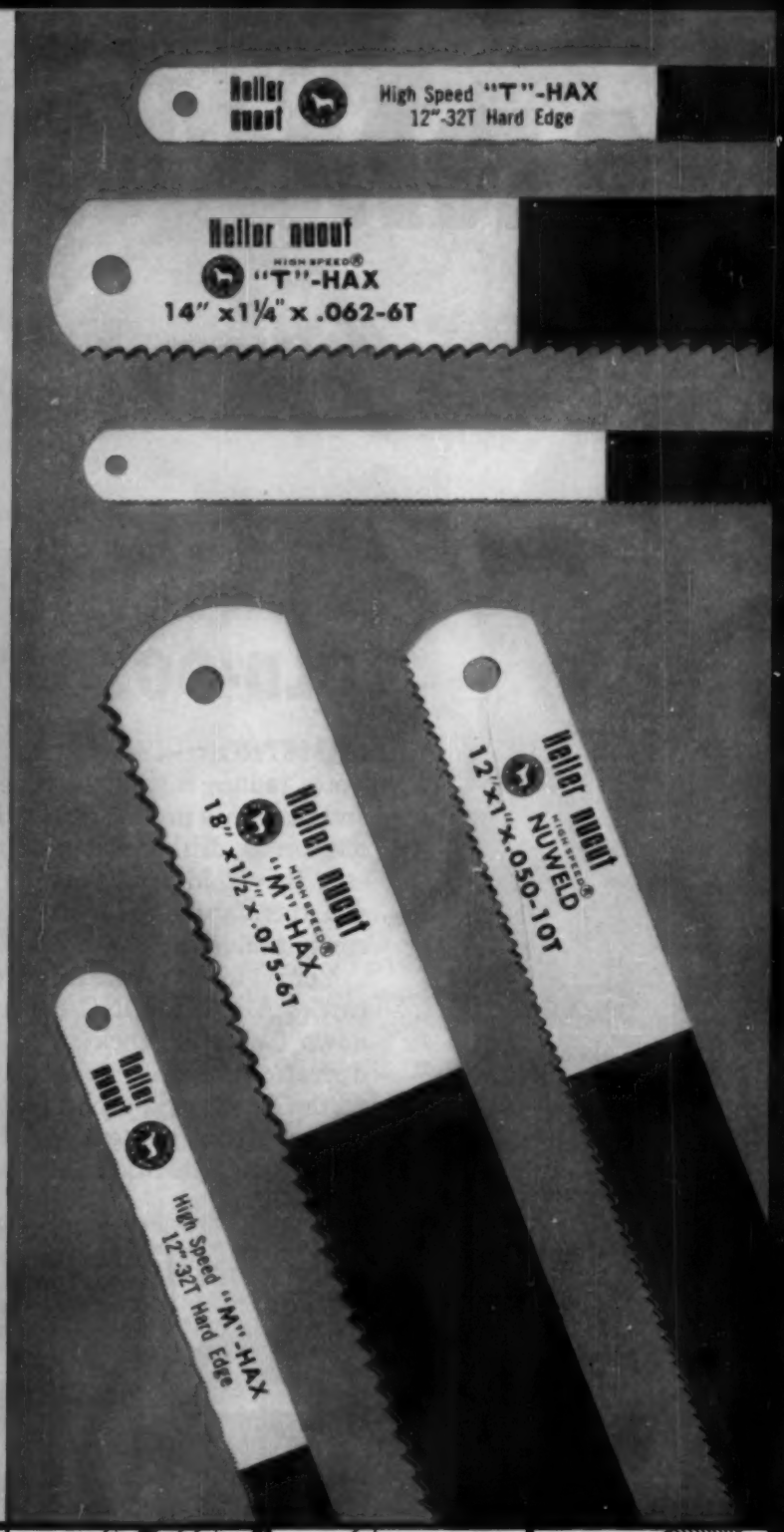
GIVE US YOUR TOUGHEST HACK SAWING PROBLEM

We'll show you how the *right* Heller Job Tempered Blade can solve it and deliver faster, smoother, trouble-free cutting over longer periods than ever before.

HERE ARE THE FACTS:

New Heller Hack Saw Catalog gives full information on sizes and types of blades offered.

WRITE FOR YOUR COPY TODAY



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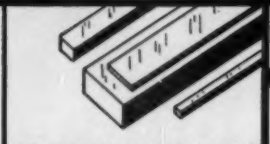
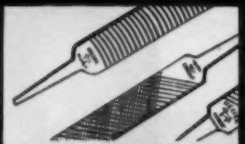


FLAT GROUND DIE STEEL

METAL CUTTING BAND SAWS



FAMOUS HELLER FILES

ARMSTRONG

T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID BLOCK

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

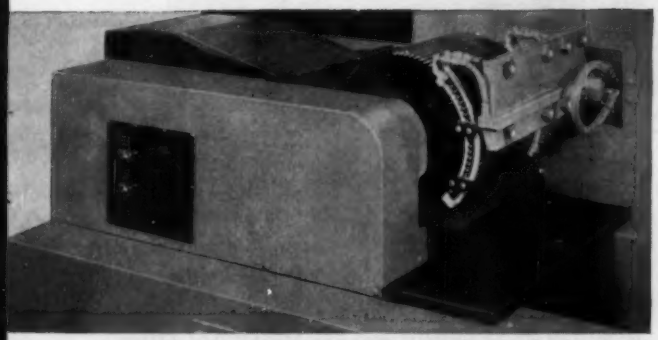
5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

new Cincinnati Inductron hardens push rods at 1-per-second rate!

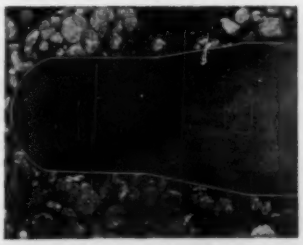
Induction hardening both ends of automotive engine push rods is accomplished at a rate of 3600 parts per hour by this new 15-kw Cincinnati Inductron®, operating at 1.2 megacycle frequency. Except for hand loading the parts into a chute, operation of the unit is automatic. Rods are gravity-fed into a "ferris wheel" which carries the parts through the work coils. Heated parts drop into the oil quench bath at one second intervals. Quenched parts are carried from the tank to tote bins by a conveyor.

This installation is one of many possible Cincinnati Inductron adaptations for the high speed selective hardening of small parts, thin walled and other parts requiring shallow case and narrow transition zone. In addition, the Inductron is equally well suited for low production operations on a wide range of work, using easy-to-form work coils. These high frequency machines are built in water or air cooled 15-kw and 30-kw, and water cooled 50-kw capacities.

You'll profit by taking your selective surface hardening problems to Cincinnati—builders of *both induction and flame hardening machines.* Call in a Process Machinery Division field engineer. He is ideally equipped to evaluate your needs and give you unbiased recommendations as to the most economical equipment for your work.



Close-up view of fixture, which accommodates two sizes of push rods, ¾″ x 10″ and ¾″ x 11½″. Part material is SAE 1065 steel. Controls include heat and fixture start-stop push-buttons and speed control knob for varying the rate of fixture rotation.



Micrograph showing push rod tip hardness pattern. Hardness achieved is 58-62 Rockwell C, with .050″ minimum case depth. Hardened area extends 5/32″ back from rod tips.

CINCINNATI

flamatic and inductron

hardening machines

PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

This is a typical boring set-up. Counterboring and trepanning tools give equally efficient results.

SHELL GARIA OIL 115 specified for

LeBLOND-CARLSTEDT RAPID BORER

. . . the machine that produces deep holes 3 to 8 times faster

The manufacturers of this new concept in deep hole boring say that the Rapid Borer was developed expressly to accommodate revolutionary new tooling which drills, bores and trepans at high speed with accuracy, and gives excellent finish. Cutting oil is forced between the boring bar and wall of stock, forming a continuous bearing. The oil is forced back through a hollow boring bar, carrying away the chips as it goes. Tool faces are kept clean and chip passage clear. Chips do not come in contact with finished bore.

To insure the success of this operation, a special cutting oil with extreme pressure and excellent cooling characteristics was required. Shell Research went to work, and out came a new addition to the Shell family of cutting oils . . . Garia® Oil 115.

If you are interested in more technical information on Garia Oil 115, write Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL GARIA OIL 115

SHELL

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automatics are the standard

at KINGSBURY

Installation of Cleveland Automatics—"AB", "AW" and "A" Models—at the Kingsbury Machine Tool Corp., Keene, N. H.

REMEMBER, CLEVELANDS CUT COSTS

The Kingsbury Machine Tool Corp., Keene, N. H., has *standardized* on Cleveland Single Spindle Automatics for their screw machine department. The Clevelands are used to blank out many of the component parts for the high production indexing automatic drilling and tapping machines which they build. Shown above are four finished parts which were originally blanked on Clevelands. Many other parts are machined complete on Clevelands.

Clevelands were selected for this work because they combine a wide range of multiple-tooled operations with quick set-up and easy control. These Cleveland qualities assure fast, accurate and low-cost production on both long and short runs.

If you produce any parts requiring turning, forming and end-working operations, you'll profit by giving Clevelands a full investigation. Call in a Cleveland sales engineer . . . or let us submit recommendations with production and cost estimates based on part samples or prints of your work. There is no obligation. For machine specifications, write for new General Bulletin describing the line of Clevelands.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

YOLOY "E" IS ON THE JOB

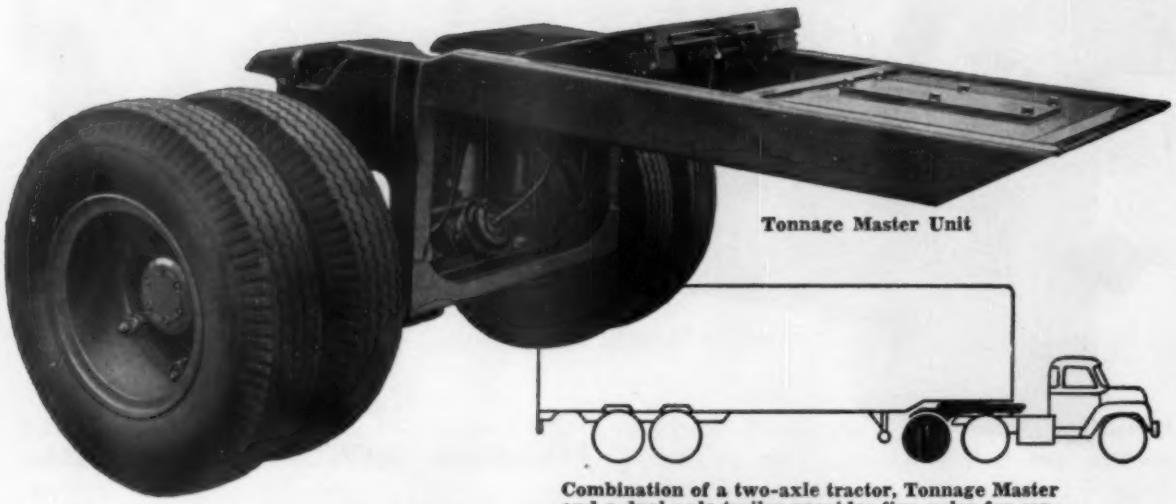
. . . providing increased strength, corrosion and impact resistance for Fruehauf's new "Tonnage Master"

This "extra axle" conversion assembly, built exclusively by Calumet Tonnage Master Fabricators, Inc., for the Fruehauf Trailer Company, enables truck operators to get maximum performance from their existing equipment.

Riding behind a two-axle tractor, a Tonnage Master provides increased load carrying capacity, reduction in tractor wheelbase, improved traction on curves, increased tire life as well as easier riding through utilization of more springs.

All components—except springs and axles—are fabricated from Youngstown's Yoloy "E" high strength-low alloy steel. This versatile steel was wisely specified to provide the units with longer life, increased resistance to shock, vibration and corrosion, as well as lighter—yet stronger—construction.

Youngstown's complete family of Yoloy steels is available in Sheets, Plates, Bars, Shapes, Cold Drawn Bars and Tubular Products. Complete informative Data Sheets on each Yoloy steel will be promptly sent upon request.



Tonnage Master Unit

Combination of a two-axle tractor, Tonnage Master and a dual-axle trailer provides five axles for carrying top loads at greater safety.

Write for these free pamphlets in The Yoloy Family series:

YOLOY "E"	High Strength Low Alloy Steel—standard applications
YOLOY	High Strength Low Alloy Steel—special applications
YOLOY "S"	Higher Strength Steel for increased service life
YOLOY "C"	Corrosion Resistant Grade for deep forming
YOLOY PIPE	Continuous Weld for corrosion resistant applications

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities

XLO EX-CELL-O FOR PRECISION

CHIP-BREAKER ASSEMBLY: On the opposite end, mounted under the reciprocating chip-breaker wheel is the chip-breaker table with vertical adjustments. It accommodates adjustable tool block fixture which holds tool in place while grinding chip-breaker groove at desired angle.

TWO MODELS AVAILABLE: Style 142 for conventional grinding with vitrified or diamond wheels; Style 264, equipped with metal-bonded diamond wheels, for *electrolytic* grinding.

new DUAL PURPOSE RECIPROCATING TOOL GRINDER

Ex-Cell-O takes all the work out of both conventional and chip-breaker tool grinding

Now an entirely new reciprocating double end tool grinder designed by Ex-Cell-O to do two jobs in one—conventional grinding on one end, chip-breaker grinding on the other—has now been added to Ex-Cell-O's line of conventional, double end, carbide and Method X tool grinders. The difference is the adjustable, power-controlled reciprocation of grinding wheels. The operator need only hold the tool at the pre-set angle.

Other features of this new grinder include: variable stroke (0 to 1½"); variable number of reciprocations (0 to 220 strokes per min.); in-built motorized precision grinding spindle, saddle-mounted to reciprocate along hardened and ground bars which are mounted on pre-loaded ball bushings. You'll want to see for yourself the capabilities of this new Ex-Cell-O—to do so, simply contact your local Ex-Cell-O Representative. Or, if you wish, write direct to Ex-Cell-O, Detroit. Ask for Bulletin 461872.

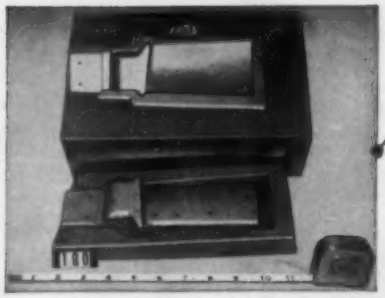
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-25

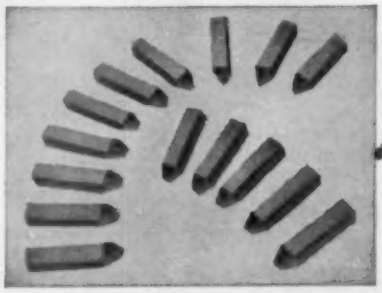
FORGING DIE

Material: Heppenstall 'A'
Conventional Machining
Time: 40 hours
Elox Setup & Machining
Time: 8 hours
Saved: 32 hours
Machine tool: Elox Standard M-500
Electrode: Cast Elo-met #3
Customers report 75% time saving in re-working dies after washout . . . no annealing is necessary.



TUNGSTEN CARBIDE SINGLE POINT TOOLS

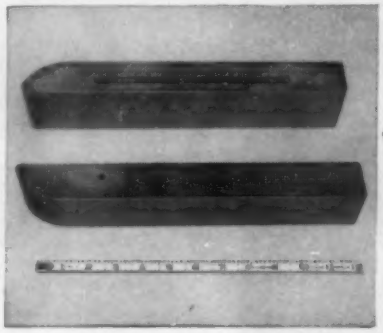
E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to ± .001". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



EMBOSSING DIE

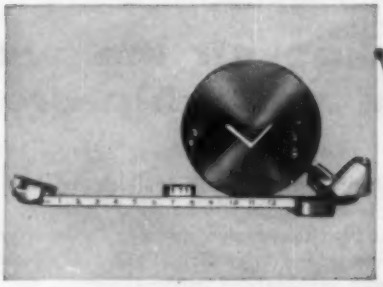
Material: Air Hardened Tool Steel
Die consists of 1,250 squares machined .100" x .030" deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining
Time: 227 hours
Elox Setup & Machining
Time: 10 hours
Saved: 217 hours
Machine Tool: Elox Standard M-500
Electrode: Free machining brass



EXTRUSION DIE

Material: Air Hardened Tool Steel
Conventional
Machining Time: 4 hours
Elox Setup &
Machining Time: 1 hr. 38 min.
Saved: 2 Hrs. 22 min.
Machine Tool: Elox Standard M-500
Electrode: Free machining brass
Machining is done after final heat treating . . . eliminating the possibility of distortion.



FROM THE HEART OF

EDM

. . . 4 jobs that prove

Elox puts you ahead of competition

These jobs were done for Elox customers in our "Prove It" Division. There's more to them than just "man hours" saved. The Elox sales engineer in your area would like to give you all the details about these and other applications of Electrical Discharge Machining. Why not write . . .

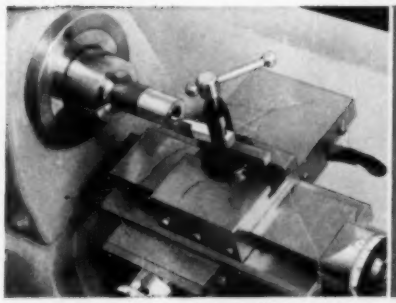
elox corporation of michigan *T. M. Reg.

1828 N. Stephenson Highway
Royal Oak 3, Michigan

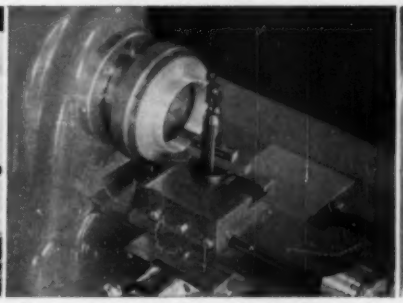
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

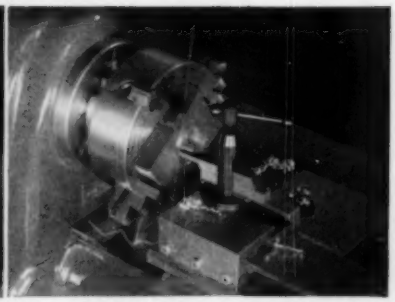
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".

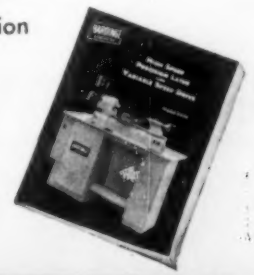


Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1⅛" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results



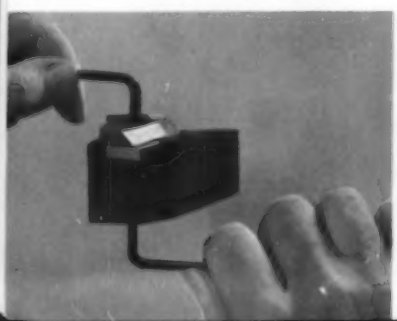
Send for Free illustrated Bulletin DV 59

OFFICES IN PRINCIPAL CITIES.
Export Office: 269 Lafayette St., New York 12, N. Y.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

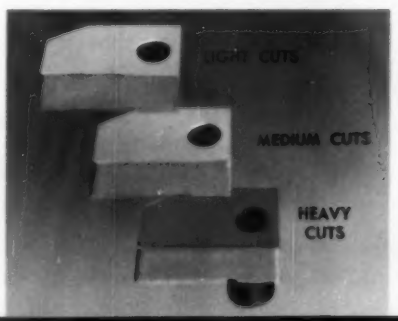
1 New! Self-loosening chipbreaker clamp. A twist of the wrist releases insert for indexing . . . automatically lifts and lowers chipbreaker. No more prying chipbreaker free. No more fumbling with loose chipbreaker. Choice of 3 chipbreaker widths for accurate chip control.

2 New! Setscrew accessible from top or bottom! Screw easily reached when holder is upside down or on its side. Easier indexing from any position.



3 New! Unique carbide-surfaced chipbreaker. New method bonds carbide coating directly to chipbreaker. Ends all possibility of braze failure.

4 New! Three color-coded chipbreakers. Choice of three widths: yellow for light cuts, silver for medium cuts, red for heavy cuts. Makes identification easy.



ANNOUNCING THE ALL-NEW CARBOLOY® LIFT-O-MATIC TOOLHOLDER

Only toolholder on the market with these 6 advanced design features

Indexes faster, easier – from any position. Setscrew on Carboloy Lift-O-Matic Toolholder can be turned from either top or bottom. Even if the holder is upside down, or on its side, the setscrew is always easily accessible.

What's more, the clamp and chipbreaker are in one piece – and rise automatically when the setscrew is loosened. There's no time wasted in fumbling with the chipbreaker or prying it free.

Reduces set-up time, speeds up production. Because Carboloy Lift-O-Matic Toolholders can be set up faster and indexed right in the machine, downtime is reduced – you get more production.

Because of the new holder design and harder steel shanks, you get closer tolerance production . . . less scrap loss.

17 styles in 8 sizes – stocked for immediate delivery. Lift-O-Matic Toolholders are now at your local Authorized Carboloy Distributor. Call today; his name is in the Yellow Pages. Or, for new Lift-O-Matic Toolholder Catalog, write: *Metallurgical Products Department of General Electric Company, 11173 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

5 New! Fewer parts to replace or stock. Holders use fewer parts. And all are standardized to cover widest range of applications. Means reduced inventories.

6 Insert clears top of the shank. Stops chipping of fresh cutting edges against walls of insert pocket. Inserts are positively clamped; clamp never touches shank.

NEW! TRANSPARENT PACKAGES FOR CARBOLOY INSERTS

New plastic package makes it easy to see what's inside...easy to pick out insert.

CARBIDE SURFACE

Now! A Complete Line of Self-Locking Microsize UNBRAKO Socket Cap and Set Screws

Nos. 0, 1, 2 and 3 in alloy steel and stainless steel are available with the Nylok* feature

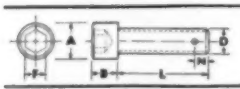
You effect major economies in time and money when you design and assemble small devices with self-locking microsize UNBRAKO socket screws. These close tolerance screws won't work loose. They simplify standardization of small devices where maximum reduction of weight is required without sacrifice of strength. They eliminate the necessity of designing costly special screws to fasten tiny parts in compact assemblies and they prevent the waste of production time while waiting for delivery of special screws.

In addition to having the overall advantages of microsize UNBRAKO socket screws, these screws can be used in holes tapped in soft or die cast materials without stripping threads and ruining expensive work. Also the set screws can be used with hardened shafts, since they lock against the threads of the tapped hole.

All UNBRAKO socket screws can be supplied with the self-locking Nylok feature. The UNBRAKO with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Seated or not, the screw locks positively wherever wrenching stops, won't work loose—because the tough resilient nylon pellet forces mating threads together.

Ask your authorized industrial distributor for details today. He carries complete stocks of self-locking UNBRAKO socket screws (caps and sets from #0 through 1 in., button heads #4 through ⅜ in., flat heads from #4 through ¾ in.). Or write us for literature and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

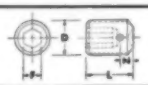
*T.M. Reg. U.S. Pat. Off., The Nylok Corporation



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO Socket Cap Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0	A .104	—	80	1/8	—	.047	5.5	14.0★	7.0★
	B .060	—	80	3/16	—	.047	5.5	14.0★	7.0★
	D .060	—	80	1/4	—	.047	5.5	14.0★	7.0★
	F .050	—	80	3/8	—	.047	5.5	14.0★	7.0★
#1	A .118	—	72	1/8	—	.047	11.0	28.0★	14.0★
	B .073	—	72	3/16	—	.047	11.0	28.0★	14.0★
	D .073	—	72	1/4	—	.047	11.0	28.0★	14.0★
	F .050	—	72	3/8	—	.047	11.0	28.0★	14.0★
#2	A .140	56	—	3/16	.063	—	24.0	3.0	1.5
	B .086	56	—	1/4	.063	—	24.0	3.0	1.5
	D .086	56	—	3/8	.063	—	24.0	3.0	1.5
	F 1/8	56	—	1/2	.063	—	24.0	3.0	1.5
#3	A .161	48	—	3/16	.063	—	40.0	6.5	3.0
	B .099	48	—	1/4	.063	—	40.0	6.5	3.0
	D .099	48	—	3/8	.063	—	40.0	6.5	3.0
	F 5/64	48	—	1/2	.063	—	40.0	6.5	3.0

★Measured in in.-gm. (those not marked with a star are measured in in.-oz.)



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO Socket Set Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0	D .060	—	80	3/32	—	.047	5.5	14.0★	7.0★
		—	80	1/8	—	.047	5.5	14.0★	7.0★
	F .028	—	80	5/32	—	.047	5.5	14.0★	7.0★
		—	80	3/16	—	.047	5.5	14.0★	7.0★
		—	80	1/4	—	.047	5.5	14.0★	7.0★
#1	D .073	—	72	1/8	—	.062	11.0	28.0★	14.0★
		—	72	3/32	—	.062	11.0	28.0★	14.0★
	F .035	—	72	3/16	—	.062	11.0	28.0★	14.0★
		—	72	1/4	—	.062	11.0	28.0★	14.0★
#2	D .086	56	—	1/8	.062	—	24.0	3.0	1.5
		56	—	3/32	.062	—	24.0	3.0	1.5
	F .035	56	—	3/16	.062	—	24.0	3.0	1.5
		56	—	1/4	.062	—	24.0	3.0	1.5
#3	D .099	48	—	5/32	.093	—	40.0	6.5	3.0
	F .050	48	—	3/16	.093	—	40.0	6.5	3.0
		48	—	1/4	.093	—	40.0	6.5	3.0

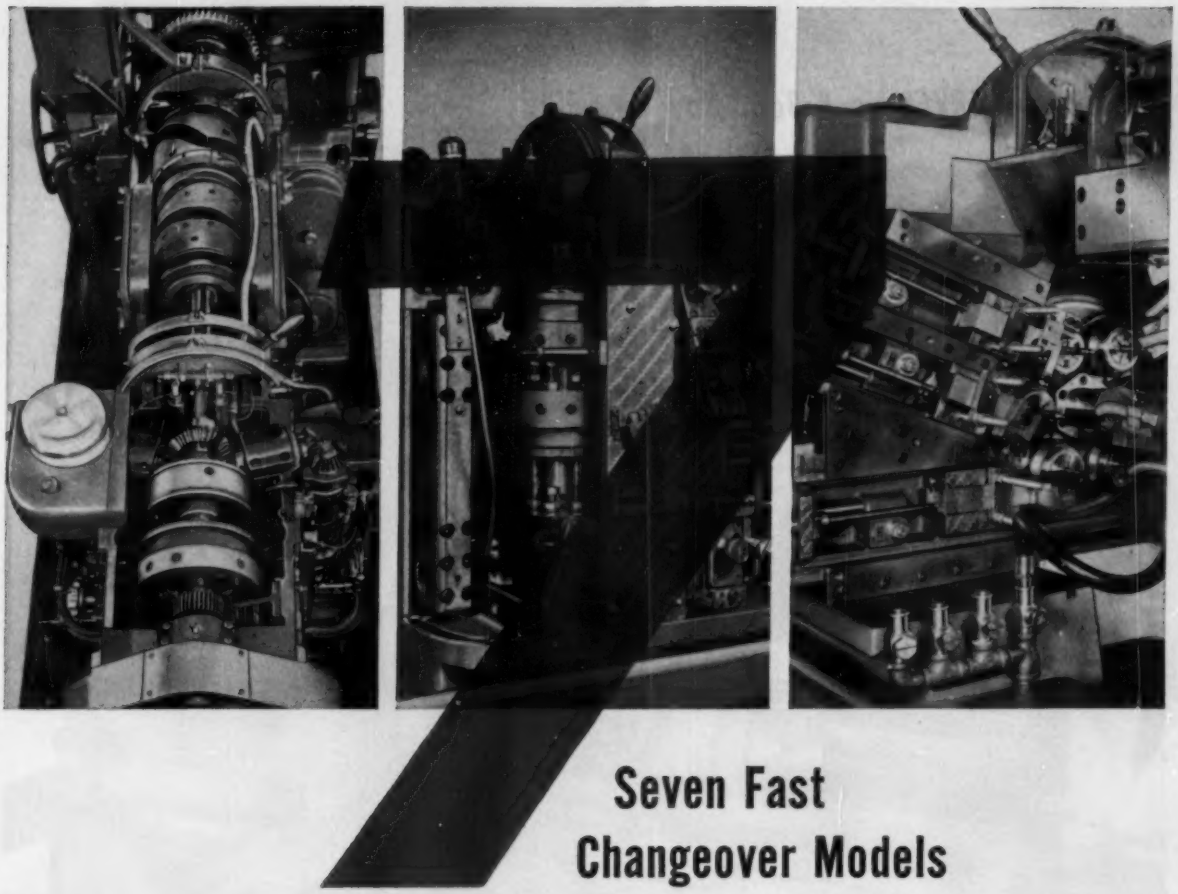
★Measured in in.-gm. (those not marked with a star are measured in in.-oz.)

Self-locking microsize UNBRAKO socket cap and set screws are available in sizes #0 through #3, in heat treated alloy steel (plated or unplated) and stainless steel, at your authorized industrial distributor. He also carries a complete stock of other self-locking UNBRAKO socket screws.

We also manufacture precision titanium fasteners. Write for free booklet.

SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co., Inc. • Cooper Precision Products • Standco Canada Ltd. Unbrako Socket Screw Co., Ltd.

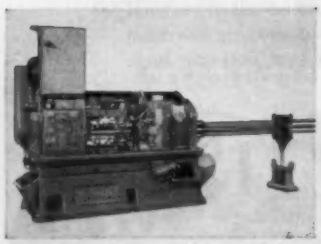


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

Operates MARVEL No. 8 Band Saw by FEEL!

sightless operator uses saw to FULL CAPACITY!

Among the many advantages of the MARVEL No. 8 Band Saw is the simplicity and convenience of operation built into this universal metal cutting saw.

Here's a case in point. Paul Stevens, who is totally blind, is employed by the Purkett Manufacturing Co., Joplin, Mo., manufacturers of laundry equipment, as a MARVEL No. 8 Band Saw operator. He operates two MARVEL No. 8 Band Saws, filling orders from the fabricating department for bars, shapes and even mitres. He handles the entire operation without assistance from anyone.

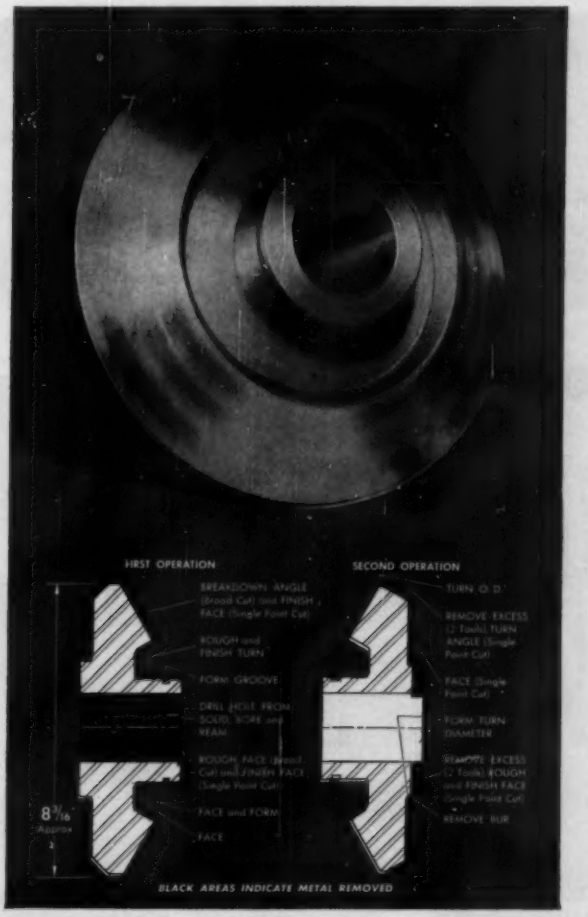
Thoroughly familiar with his stock and bin locations, he sets up the saw, measures lengths, and turns out work accurate to ½". Almost any conceivable sawing job is handled on these machines, from the smallest, most delicate work to heavy beams, up to 18". They will cut-off bar stock, pipe, tubing, moulding and structural shapes—saving hours of machining time.

The MARVEL No. 8 vertical column design, table height working surface, easy accessibility to simple operating controls, fast and positive power or manual feed control, column and blade tilting to any angle up to 45° right or left of vertical for cutting at an angle or mitre—are just a few design and operating features that make MARVEL No. 8 Band Saws the best all-around saw you can buy.

For the complete story, write for the new Bulletin 875, which illustrates and describes this outstanding universal metal cutting saw.

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVENUE, CHICAGO 39, ILLINOIS

MARVEL *Metal Cutting* SAWS
Better Machines–Better Blades


FIRST OPERATION
SECOND OPERATION
BREAKDOWN ANGLE (Broach Cut) and FINISH FACE (Single Point Cut)
ROUGH and FINISH TURN
FORM GROOVE
DRILL HOLE FROM SOLID, BORE and REAM
ROUGH FACE (Broach Cut) and FINISH FACE (Single Point Cut)
FACE and FORM
FACE
TURN O. D.
REMOVE EXCESS (2 Tools) TURN ANGLE (Single Point Cut)
FACE (Single Point Cut)
FORM TURN DIAMETER
REMOVE EXCESS (2 Tools) ROUGH and FINISH FACE (Single Point Cut)
REMOVE BUR
8 3/16" Approx.
BLACK AREAS INDICATE METAL REMOVED

Let me show you how one of our P & J Automatics

put this

"PROBLEM" Job on a PAYING BASIS!

Some of the toughest machining jobs you'll ever have to handle get that way, *not* because of any *single* factor like extra-hard metal or really heavy cutting, but because of *several* contributing factors that can add up to a lot of machining time and a big profit loss. The job shown here . . . which one of our customers brought in recently . . . is a good example. A glance at the "Job Facts" will show you a combination of factors that could easily have made this job a real problem. The most difficult of these requirements was machining the bevels . . . which had to meet close tolerances for size and conformity to the true angle and, in addition, demanded a fine finish with *no* tool-return marks permitted. However, handling this part on a Potter & Johnston 4-U Automatic, with a tooling set-up engineered by P&J Tooling Specialists, put this potential headache on a high-output, high-profit basis.

HERE ARE THE JOB FACTS:

PART: *Bevel Gear*

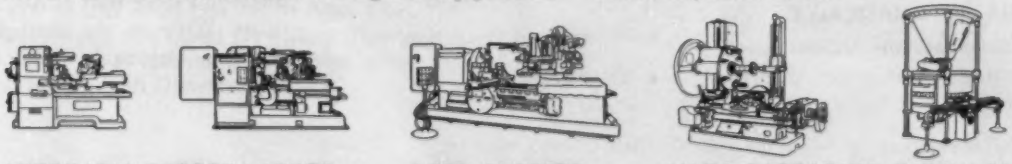
MATERIAL: *Steel Forging, 190 Brinell*

MACHINING REQUIRED: *22 separate roughing and finishing cuts including several hard-to-handle angle cuts.*

SPECIAL REQUIREMENTS: *Hold bevel angles to close tolerances and produce a good finish.*

RESULTS: *A part finished every 13 minutes floor-to-floor time . . . on a P&J 4-U Automatic!*

A new P&J Automatic can put *your* problem jobs on a paying basis too! Send me your sample prints and I'll show you how a P&J Automatic with P&J Tooling can help you turn out your toughest jobs faster, better and at lower cost. Write Potter & Johnston Company, Pawtucket, Rhode Island.



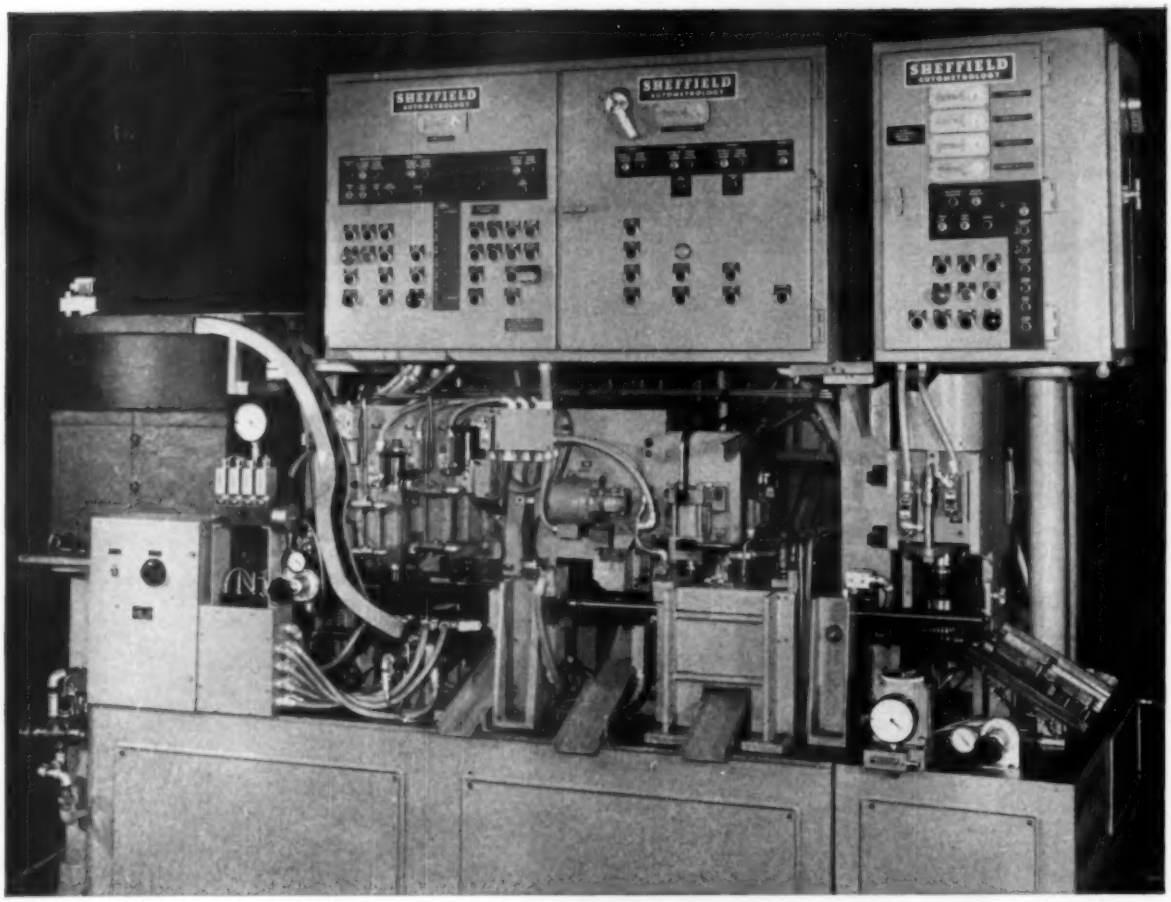
AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . GILDA PACKAGING MACHINES

P&J

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898



COMBAT RISING PRODUCTION COSTS with AUTOMATIC GAGING and ASSEMBLY

Tapered roller bearing components are:

Gaged

Selected according to size

Assembled and—

The completed bearings given an operational test

ALL AUTOMATICALLY

Eliminated are the tedious hand operations and the scrap due to errors in judgement of both inspectors and assemblers.

This is one of the many cost-saving achievements of Sheffield's Autometrologists. Others involve any possible combination of Automatic Gaging with:

- Machine Control
- Sensing and Prediction
- Feedback
- Sorting by Classification Category
- Completely Automatic Assembly

If you contemplate reducing your costs through automation, utilize the ingenuity and resourcefulness of Sheffield's large staff of Autometrologists. Write to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.

the SHEFFIELD corporation

of Bendix Aviation Corporation

manufacture, and measurement for mankind

7961

ACCO for Better Values

SPEEDY SLING SERVICE with ENGINEERED SAFETY!

ACCOLOY® KUPLEX SLING CHAINS

Quick Service from Distributor's Stock!

• Your nearby ACCO Authorized Sling Chain Distributor now offers a new sling service that saves time and money for you. This is made possible by American Chain's sensational, newly-designed **ACCOLOY KUPLEX Sling Chains.**

SAFE, STRONG, STREAMLINED

These slings are the *latest and greatest development* in sling chains. All parts in each leg are manufactured *exclusively* by American Chain, of the same alloy, and engineered to be as strong as the chain itself. They are of a streamlined design that reduces the possibility of catching or snagging.

Finally the component parts are factory proof-tested to twice the working load limits—your assurance of maximum strength and safety.

Another valuable feature: all parts remain visible for easy, periodic wear inspection.

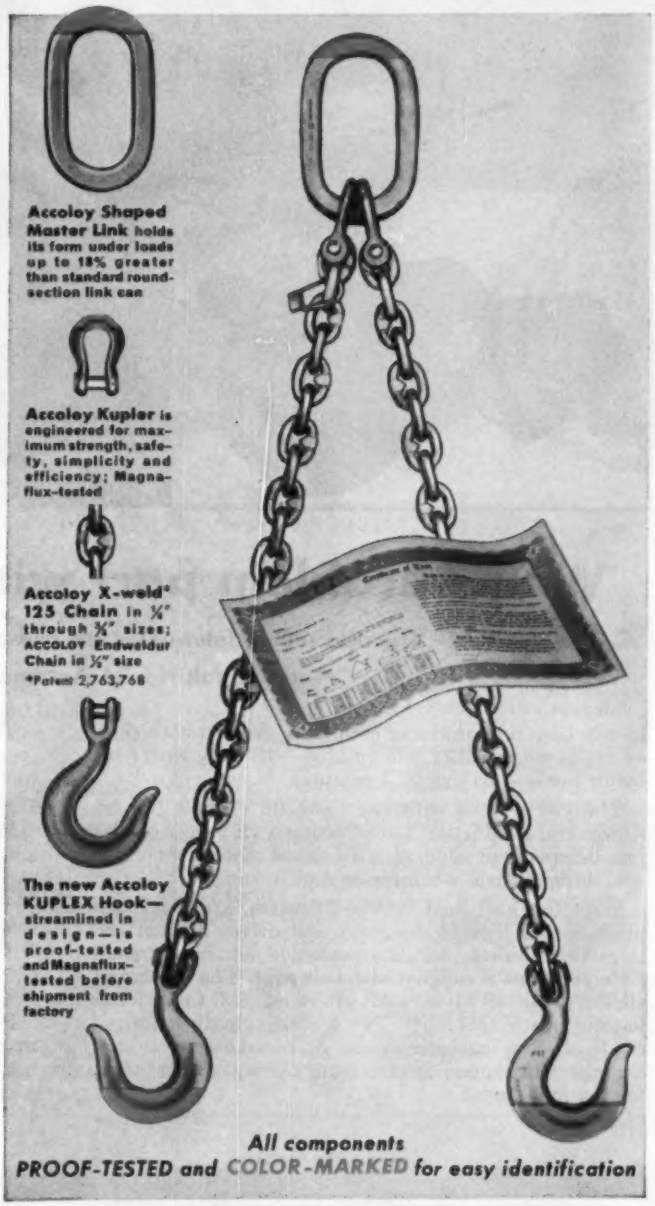
TWO STYLES—SIX SIZES

The new ACCOLOY KUPLEX Sling Chains are available in single-leg and two-leg styles and in six chain sizes, from ¼" through ⅞". All chain is made of Accoloy 125 material. All component parts of each assembly are marked and easily identified as to the size of chain with which they are to be used. Components are *color-marked in* orange for easy identification.

CERTIFICATE OF TEST, issued by ACCO and signed by your Authorized Distributor, is furnished with each sling shipment.

GET THE COMPLETE STORY

You will find it to your advantage to learn the full story of ACCOLOY KUPLEX Sling Chains—how easy they are to assemble and disassemble . . . how promptly and easily they can be serviced . . . and how you can benefit from this Great New Distributor Service and this Great New Sling Chain. Write for **Folder DH-54** and name of nearest ACCO Authorized Sling Chain Distributor.


Accoloy Shaped Master Link holds its form under loads up to 18% greater than standard round-section link can
Accoloy Kuplor is engineered for maximum strength, safety, simplicity and efficiency; Magnaflux-tested
Accoloy X-weld* 125 Chain in ¼" through ⅝" sizes; ACCOLOY Endweldur Chain in ¼" size
*Patent 2,763,768
The new Accoloy KUPLEX Hook—streamlined in design—is proof-tested and Magnaflux-tested before shipment from factory
All components
PROOF-TESTED and COLOR-MARKED for easy identification

American Chain Division

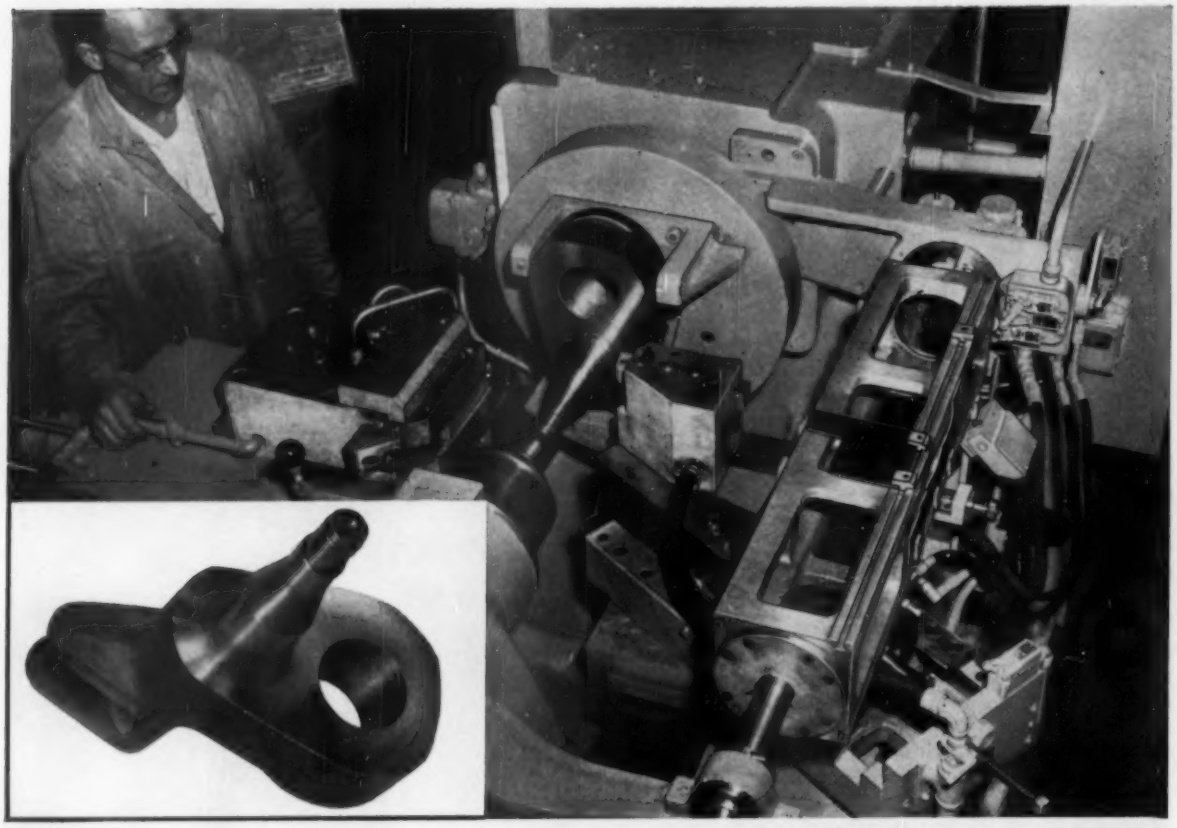
AMERICAN CHAIN & CABLE

Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

ACCO

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

***Indicates Warehouse Stocks**



Whips problem part with right equipment

Handles tough, interrupted cut and contour machining easily with Gisholt No. 24 Automatic with JETracer

Here's how this producer is holding floor-to-floor time on military tank idler arm forgings—18″ long with 5½″ major radius—to just 21.1 minutes.

The job is done with the powerful Gisholt No. 24 Automatic Production Lathe, using a JETracer on the rear independent slide, plus a 2-speed motor for correct machining speeds when facing and turning.

With the part held between centers, a special face plate fixture locates the work and drives against the large O.D. radius. All cuts are made separately; each slide performs a rough and finish pass. The front tool slide faces at 60 r.p.m. and .015″ feed (306 f.p.m.) and has automatic tool relief. Two tools divide the length of cut to shorten machining time. A special step-over cam arrangement repositions the front carriage and its tools for the finish pass.

The JETracer uses a 4-position indexing cam roll (permitting up to 4 automatic passes if needed), and controls the rear slide which turns all diameters on the idler arm at 180 r.p.m. and .015″ feed (259 f.p.m.).

Whatever your production picture on large parts—long steady runs or small repeat lots—you'll find proven ways to cut costs with the Gisholt MASTERLINE No. 24 Automatic Production Lathe. One operator handles 2 or more of these powerful machines, or does other jobs during machining time, because all machine functions are automatically controlled. Setups and change-overs are fast and simple.

For complete details on the No. 24 and other Gisholt machines, call your Gisholt Representative today. He has the facts, and his wide experience may point the way to more profitable production in your plant.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

Watch faces light up like a Christmas tree . . .

. . . when you put CIMCOOL° on the job in your plant. For CIMCOOL Concentrate—the largest selling chemical cutting fluid in the world—can increase your production and save you money. Here's why:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil hands or clothing. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

See your CIMCOOL distributor for full information on all the advantages of CIMCOOL Concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids.

Or contact us direct. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates** — For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

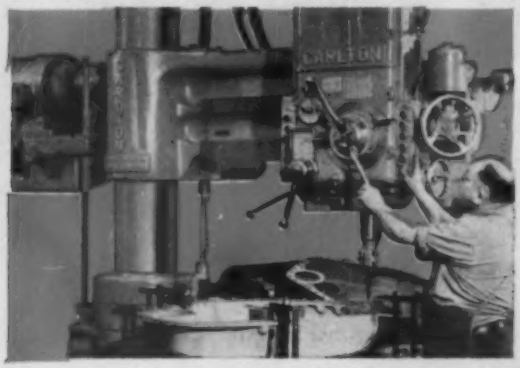
CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO

now take your choice of 4 different speed-feed controls



1 ***Manual*** 2 shifter levers for controlling speeds, 2 for controlling feeds.

2 ***Partial pre-selector*** 1 dial and 1 lever selects 36 spindle speeds. Feeds selected manually.

Programming pre-selects speeds and feeds for an entire drilling program including as many as 20 or 30 operations.

Operator is free to concentrate on starting and stopping spindle, changing cutting tools . . . speeds and feeds having been pre-set.

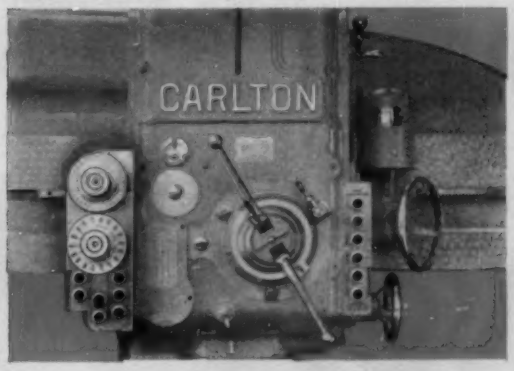
plan and pre-set speeds . . . with

Carlton

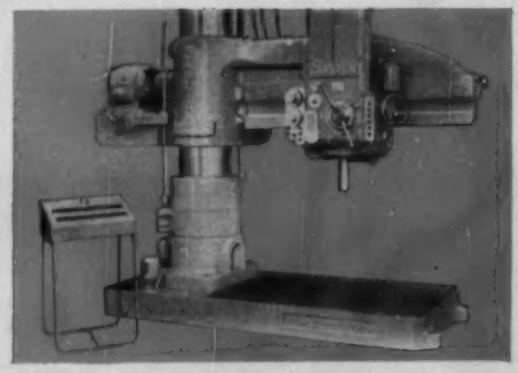
Now you can choose exactly the right radial drill speed-feed control for your requirements . . . from among the four now offered exclusively by The Carlton Machine Tool Co.:

Programming: Here's how the Carlton-Leber programming works: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint and is transferred to the programming console.

offered only by Carlton, specialists in radial drills



3 ***Pre-selector*** 2 graduated dials (one each for speeds and feeds) pre-set speeds and feeds.



4 ***Pre-selector and programming*** Sets up correct speeds and feeds for a complete sequence of operations.

and feeds for an entire drilling program

programming

The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector: For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes inoperative. The pre-selector saves time by allowing operator to select the speed and feed for the next operation while the machine is under cut.

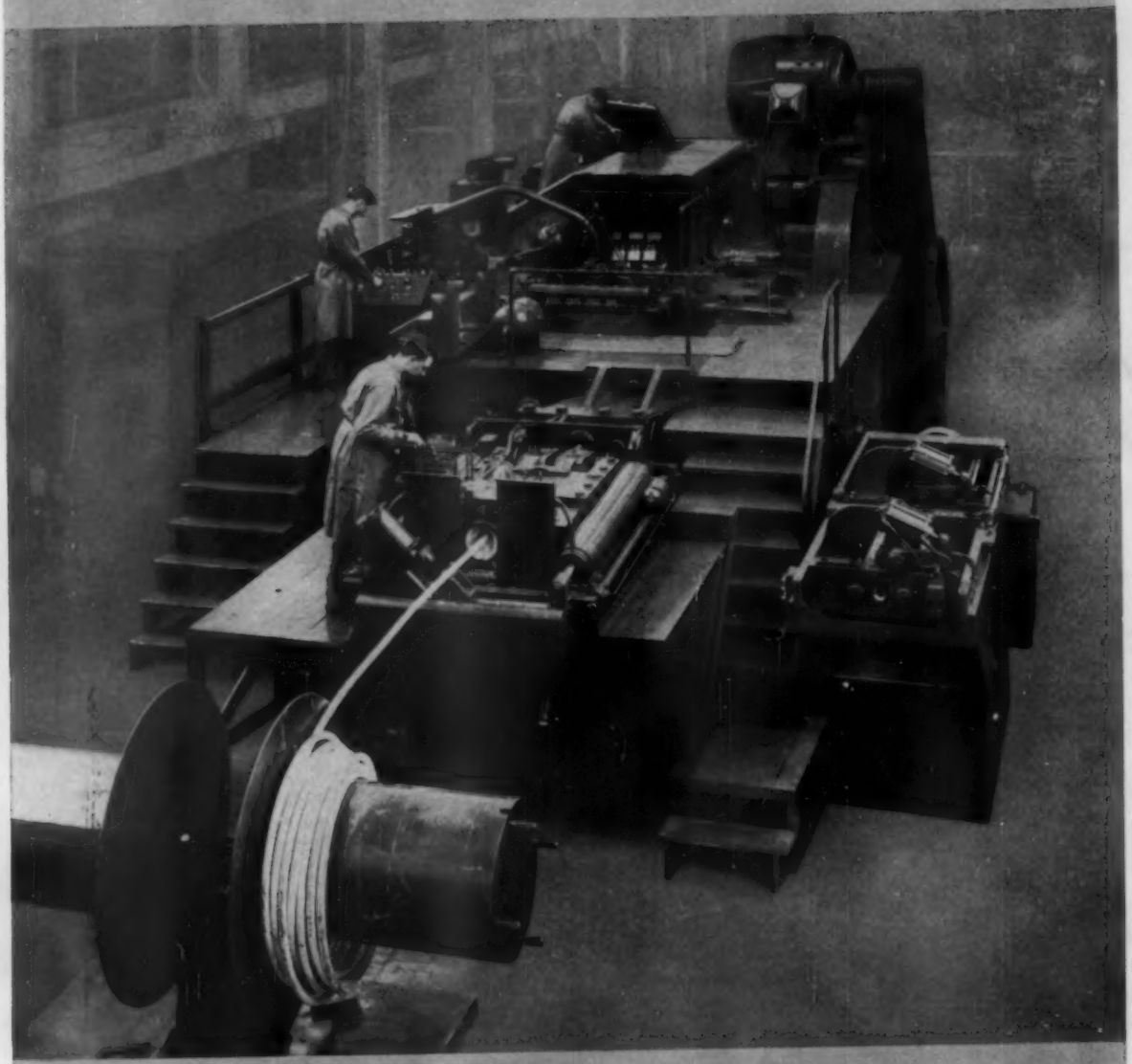
Partial Pre-selector: Pre-selects four different speed ranges and neutral. Nine speeds are selected manually in each range. Reduces by half the time required to shift over the manual method.

Manual gear shift also available.

It will pay you to re-evaluate your radial drilling operations. You'll find one of these Carlton controls will fit your requirements perfectly – and will help reduce your drilling costs. For complete information, send today for descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

Carlton *specialists in radial drills*

Cleveland Cap Feeds This Biggest 13 Minutes and Produces 494



THE 1-1/4-INCH BOLTMAKER

WEIGHT: 400,000 POUNDS
MOTOR HORSEPOWER: 200
PIECES PER MINUTE: 38

Boltmaker One Ton of Steel Every Four-Pound Cap Screws . . .

20 Times Faster!

This 1-1/4" x 10" Cleveland precision cap screw is now being cold-forged automatically on the Boltmaker at the rate of 38 per minute.

This tremendous 1-1/4" Boltmaker opens new horizons in the automatic cold-forging of metal components. It is the largest machine of its kind ever built, four times larger than its immediate predecessor, the 3/4" Boltmaker.

We pioneered this first 1-1/4" Boltmaker for The Cleveland Cap Screw Company. Specialists since 1916 in cap screws, set screws, studs and fasteners, including "larger than usually listed sizes," Cleveland Cap is now relying on its new 1-1/4" Boltmaker for the exacting task of producing the large cap screws illustrated above.

In this forging operation, the Boltmaker draws the steel rod to size, cuts it to proper length, extrudes the blank, heads, trims the head, points the end and rolls the threads, *all automatically!* All operations occur at one time and a complete, ready-to-use cap screw is cold-forged on each stroke of the machine. Grain flow in the head and threads is symmetrical and unbroken. The part is stronger because the forging action increases fatigue resistance and tensile strength.

This giant Boltmaker can be tooled to cold-forge many other large-size special products.

Whether your forging problem is one of making four-pound precision cap screws or a wide variety of other metal components in various sizes, we invite you to send us your prints and samples. Better yet, pay us a visit, and discuss with us how the latest methods, machines and ideas fit into your future metalworking production.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

NEW BRIDGEPORT METAL LAMINATES

Offer Design and Production Opportunities No Single Metal Provides

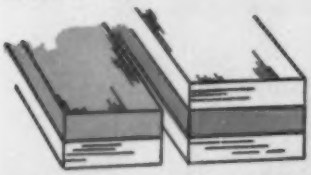
Inside and outside story of metal laminates, their range of applications and properties.

Typical applications include copper/stainless electric frying pans, heat exchanger tube sheets, salt pots, electric terminal strips and contact parts.

BRIDGEPORT METAL LAMINATES open up entirely new concepts in product design and application. Made up of layers of two or three dissimilar metals, metallurgically bonded, they can provide a combination of chemical, physical and mechanical properties that would be impossible to obtain with a single metal.

A Metallurgical "Sandwich"

Layers of metals are combined in either Duplex or Triplex form and are held together permanently by means of a specially developed braze-type bond. This bond has exceptional shear strength. There is no peeling, cracking or chipping, even in thin laminations. Furthermore, because it is a true metallurgical bond that joins the component materials, better use can be made of the individual physical properties of each metal.



Duplex Laminates Triplex Laminates
Metallurgical bonding makes a laminate a "one-piece" metal with multi-metal characteristics.

Many Uses

A variety of metals can be formed into Bridgeport laminates. Thus it is possible to develop an almost unlimited variety of properties with different metal combinations. Some of the jobs, for instance, that can be performed are in:

1. Solving dual corrosion problems
2. Improving electrical and thermal conductivity
3. Combining high thermal conductivity with corrosion resistance
4. Obtaining greater strength-to-weight ratios in combination with other specific properties, such as conductivity or corrosion resistance.

Typical metals that can be combined are copper, brass, stainless steel, Muntz Metal, monel, mild steel, iron and the precious metals. Other combinations are possible.

Advantages

In addition to offering a wide range of desirable characteristics, Bridgeport Laminates offer unusual design and production economies. They are easily formed and joined. They can be furnished in desired shapes and formed to size, thus replacing forgings which would involve high machining costs.

In many instances, too, a thin sheet of relatively expensive material laminated with a thick sheet of less costly metal is more economical than a thick sheet of the more expensive material.

Properties Can Be Varied

Laminate properties are "tailor-made" and depend on the combination of metals used. However, some of the general characteristics can be stated.

The strength of an individual laminate combination approximates the average strength of each of the bonded metals, depending on the amount of each metal in the laminate.

Thermal conductivity is based on the same conditions.

Ductility depends on the metals used. The laminates are usually furnished in the annealed condition, ready for forming. Surface finishes are not permanently affected by laminating.

Types, Sizes

In Duplex Laminates, either component can vary in thickness from .010 to 2 inches. They are made in sizes up to 30 inches square and, in many cases, even larger.

Triplex Laminates vary in component thickness from approximately .015 to 2 inches.

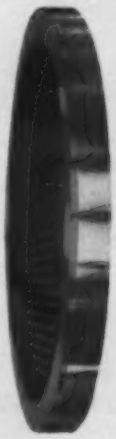
Samples

Test samples of Bridgeport Metal Laminates for development work are available through all Bridgeport Sales Offices. Specifically, copper/stainless Duplex Laminates and stainless/copper/stainless Triplex Laminates are immediately on hand and special combinations can readily be furnished.

Engineering Assistance

The design and manufacturing possibilities for Bridgeport Laminates are extremely flexible and offer virtually unlimited advantages. Bridgeport's long experience in the laminate field can be of decided benefit to you. We will be glad to furnish you with detailed technical assistance on any specific problem. Call your nearest Bridgeport office for full details.

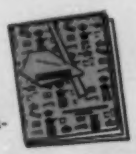
Copper/Stainless Steel Laminates Offer Many Desirable Characteristics



Copper/stainless steel laminates have excellent heat transfer properties, high structural strength, are non-magnetic and have no appreciable thermostatic action to cause warpage or distortion. Likewise, their corrosion resistance is high, especially in applications where dual corrosion problems exist.

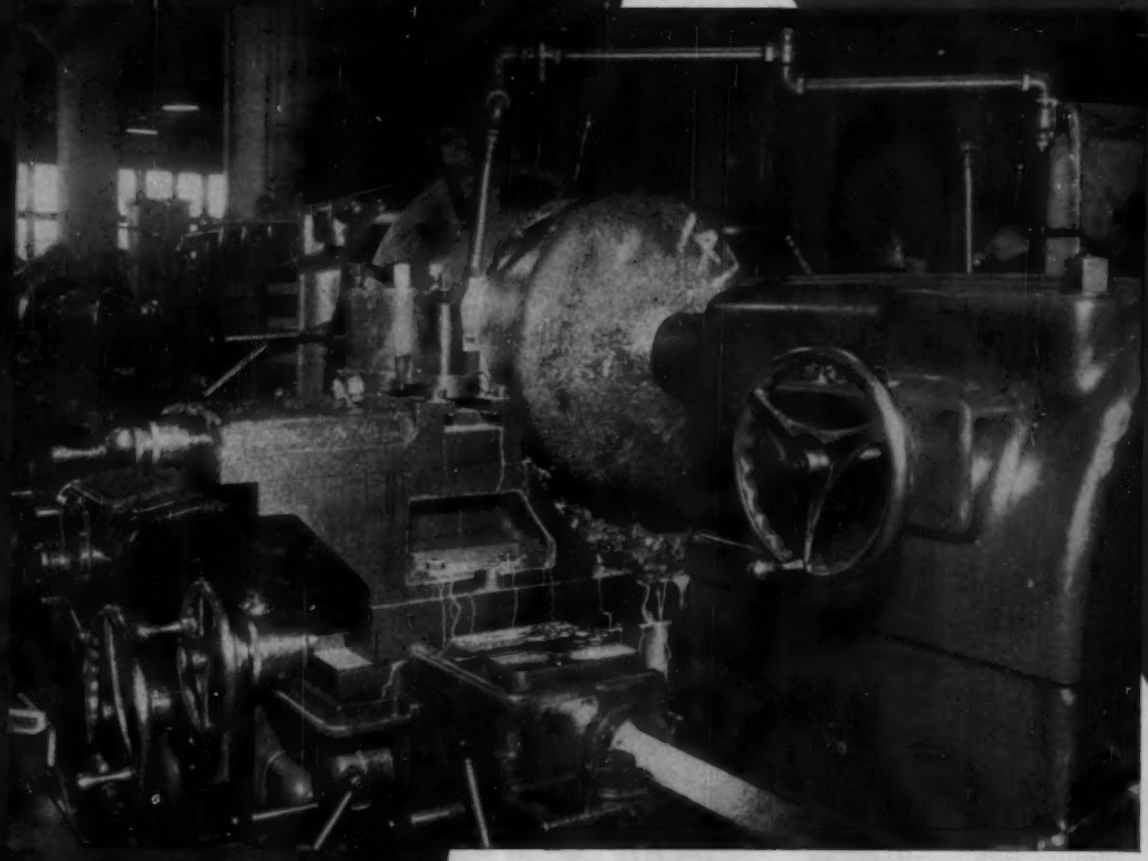
Heat exchanger tube sheet. 2 in. ASTM A-201 Gr. A firebox plate. 3/8 in. naval brass.

Free Laminates Brochure
Bridgeport Metal Laminates, their properties, applications, types, sizes, are described in an 8-page technical publication. Write for your copy today.



BRIDGEPORT BRASS

Offices in Principal Cities
Bridgeport Brass Company, Bridgeport 2, Connecticut
In Canada: Noranda Copper and Brass Limited, Montreal



"AMERICAN"

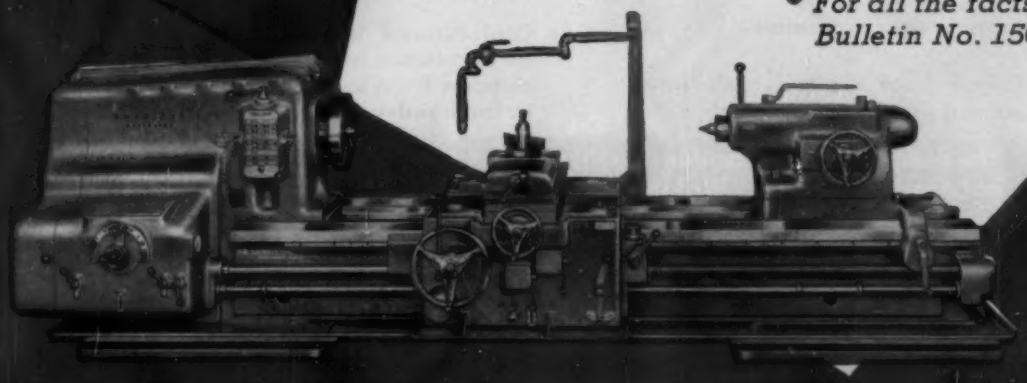
"Scalping" a $12,000 TITANIUM Ingot...

The operation shown by the accompanying illustration is "scalping" (cutting) the hide off of an ingot of pure titanium sponge. The ingot is 25" in diameter and the skin or hide that must be turned off is from ½" to 1" thick.

Due to the terrific cutting resistance of this "hide" low cutting speeds and exceptional ruggedness and rigidity are essential to satisfactory tool life.

Because power, rigidity, ruggedness and inherent stamina are outstanding characteristics of "American" Pacemaker Lathes they have been selected for this severe service by all of the major titanium fabricators.

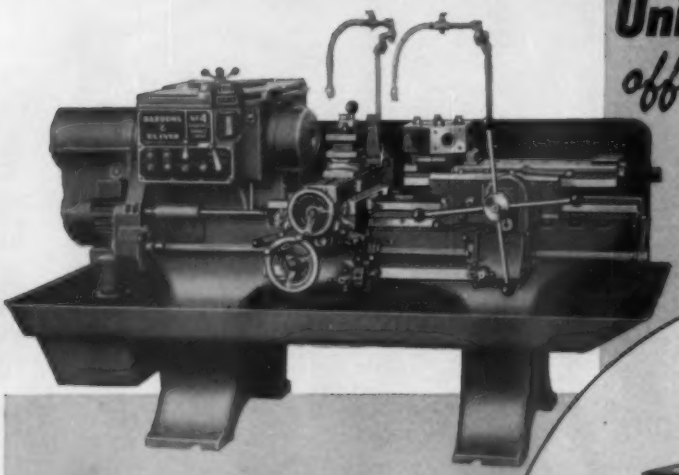
• *For all the facts ask for Bulletin No. 150.*



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

The BARDONS & OLIVER No. 4 Universal Turret Lathe offers these outstanding HEADSTOCK Features



- Sixteen geared spindle speeds, providing a fifty to one speed range
- Optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant horsepower (optional to fifteen) at all spindle speeds
- Fast operating and effortless electric headstock clutches
- Fully automatic spindle speed changing in less than two seconds
- Minimum number of gears in mesh at higher spindle speeds
- All anti-friction bearings
- Flanged type motor mounting
- All headstock gears of alloy steel, flame hardened and precision finished

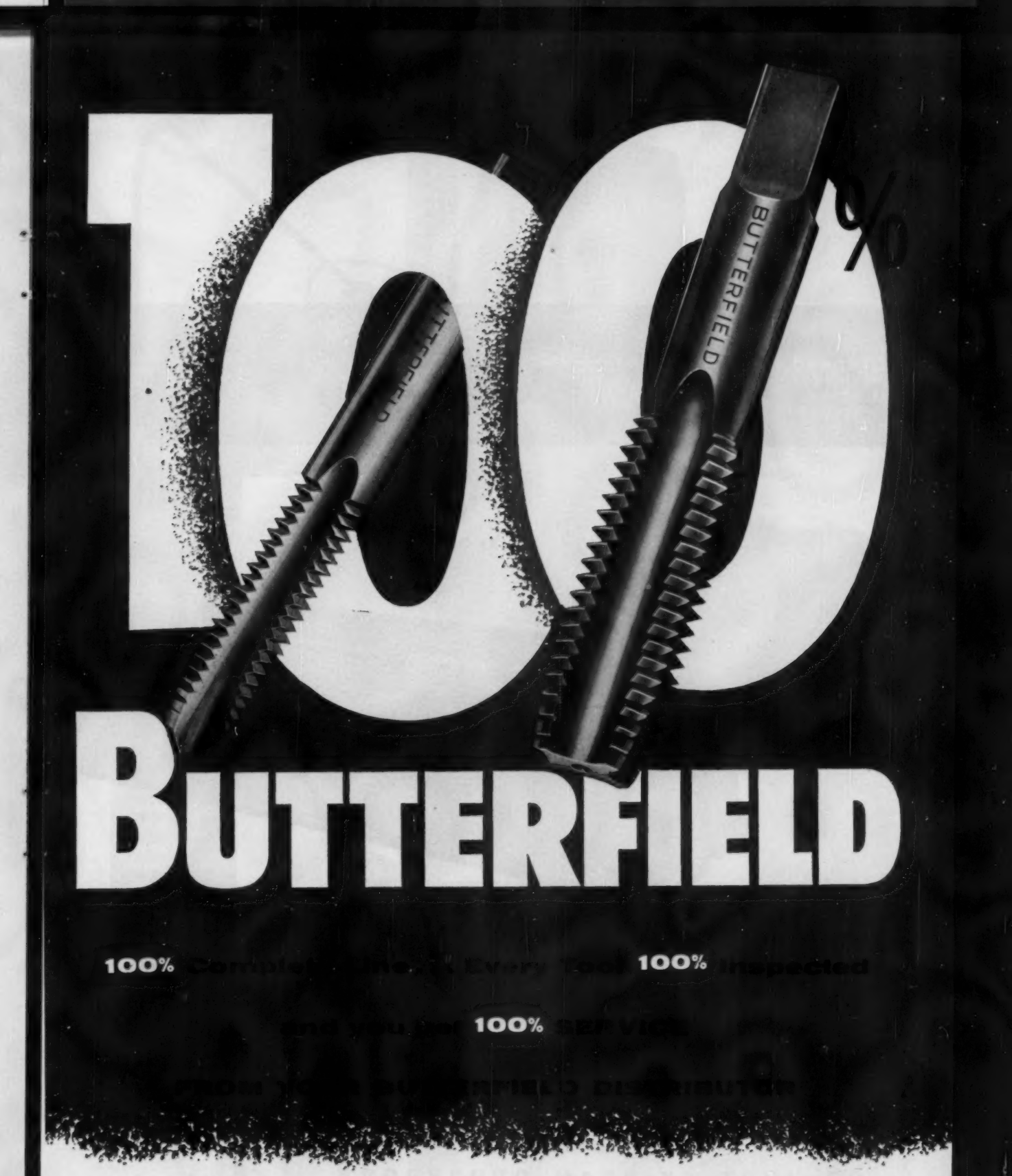
- Headstock shafts of alloy steel, heat treated, ground-in-spline, of large diameter and short span between bearings
- All rotating assemblies statically and dynamically balanced
- Cool, filtered lubricating oil pumped to all headstock bearings, gears and clutches from separate reservoir in the head-end leg

The complete line of Bardons & Oliver Turret Lathes offers many outstanding features. Write us on your company letterhead for specific model information or send your blue prints for a proposal.

MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, INC.

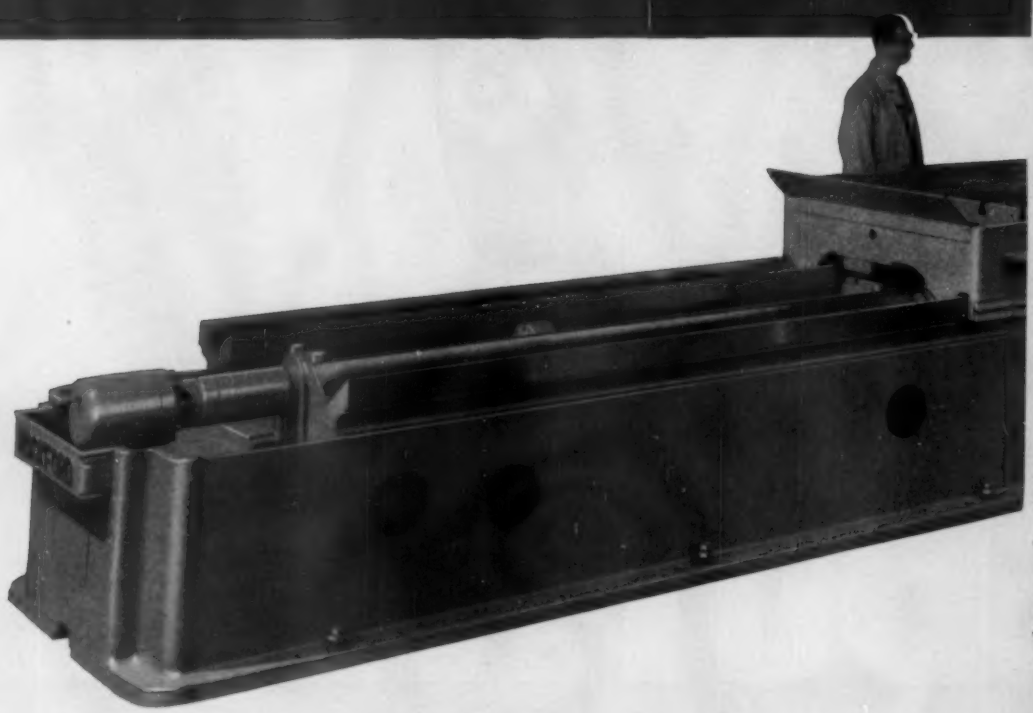
1134 WEST 9TH STREET • CLEVELAND 13, OHIO

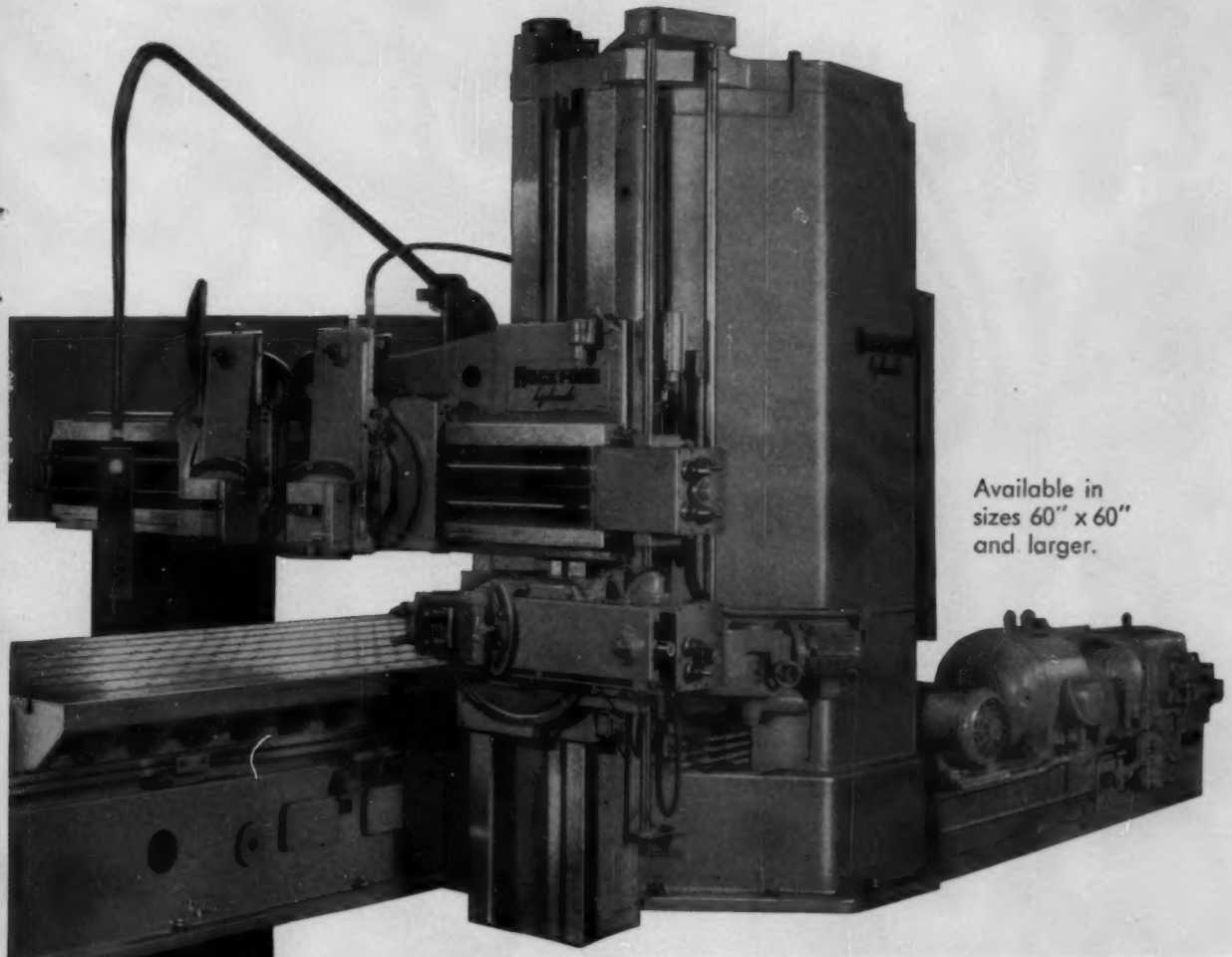


Butterfield also offers a complete line of taps, dies, drills, reamers, cutters, end mills, hobs and carbide cutting tools. There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. **BUTTERFIELD DIVISION** • Union Twist Drill Company • **Derby Line, Vermont.**

2-speed traverse motors eliminate manual positioning in set-up on

new Rockford Hydraulic Planer





Available in sizes 60" x 60" and larger.

complete pendant control speeds operation and set-up

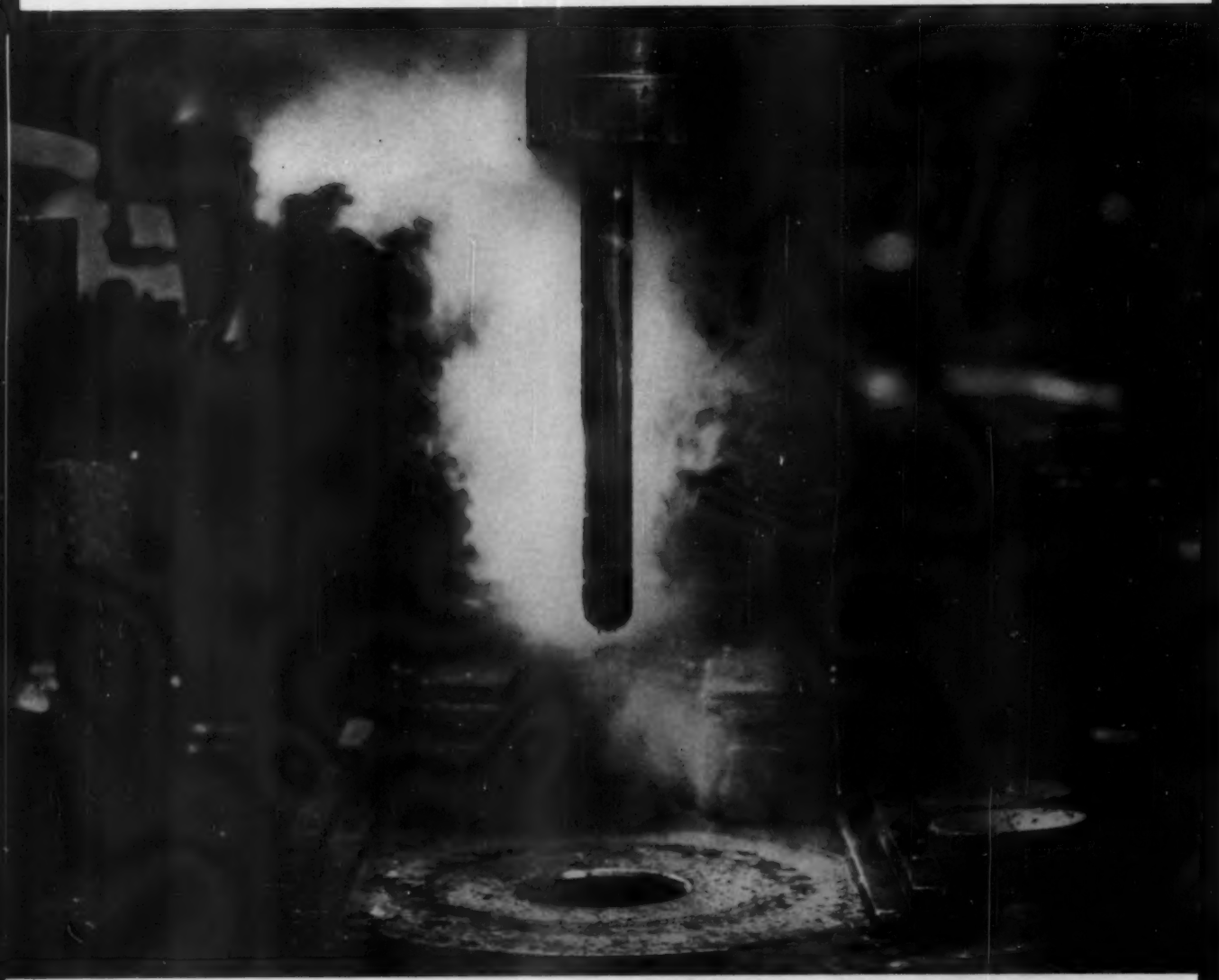
All feed and traverse movements are selected and operated from the push button station of this new Rockford hydraulic planer. Two-speed traverse motors — high speed for approximate positioning, and slow speed for extremely close power positioning of rail and side heads — eliminate the need for manual positioning in setting-up for a job.

Extra-rugged construction affords use of most modern cutting tools and cutting techniques. The machine is equipped with the new high speed h3 triple circuit.

Get full details on the wide production flexibility of this new hydraulic planer from any Rockford Machine Tool Co. representative, or write directly to us.

h HYDRAULIC

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



Tough 2½" diameter mandrel at Rc 44 on 1150 ton brass extrusion press. Scovill Manufacturing Co.

Mandrel of HALCOMB 218 retains toughness and hardness at hot work temperatures...

This mandrel is made of Halcomb 218—a tough, air-hardening hot work steel. Halcomb 218 is suitable for tools like this which require a higher degree of toughness at moderately elevated temperatures than is obtainable with the tungsten types of hot work steels. And Halcomb 218 *retains both* its hardness and strength at these temperatures.

For example, at a hardness of Rc 44, Halcomb 218's Charpy Impact Strength is 33 ft-lbs at 500F. And it will retain this hardness after 1 hour, after 10 hours and even after 100 hours at temperatures up to 900F.

Properties like these cut tooling costs. The mandrel shown above is good for 1200 pushes, for example, and even then all it needs, usually, is repolishing before being used again.

Halcomb 218 is particularly useful for all hot work operations on which drastic coolants are used. It even resists breaking very successfully when water cooled in operation. If these sound like advantages you can use, call your local Crucible representative for more complete data. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

automation at its best!! as *only BAUSH can do it* - -

with Baush *completely mechanical* transfer machines using "S"-Type Leadscrew Units . . .

TO GIVE YOU:

Easy, economical maintenance with shop mechanics . .
Interchangeability of units . .
No expensive hydraulic oil . .
No costly hydraulic leaks . .
Positive, steady tool feed . .
No surge or tool breakage in break-thru . .
Longer life of motors, gears, spindles and guide bushings . .

WHY NOT TRY US?

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

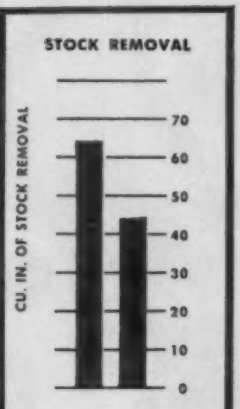
PROVED BY INDEPENDENT LABORATORY TESTS:

48.5% S•M•I*

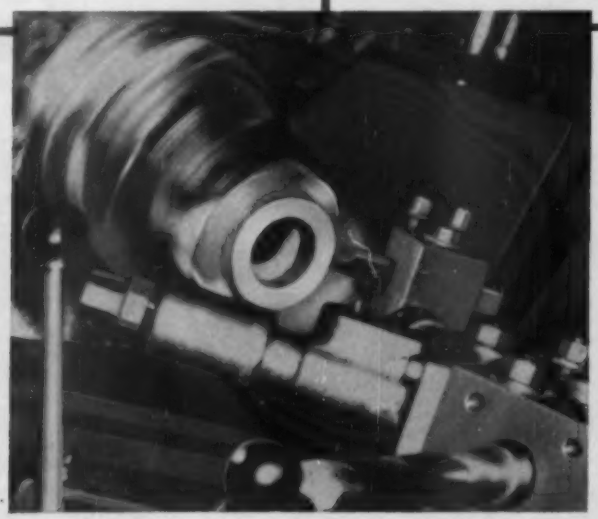
for FERROCARBO®-TREATED IRON

These impressive test results were obtained by an independent research laboratory on gray iron farm equipment castings produced by a leading Midwest foundry, using untreated and FERROCARBO-treated iron of identical chemistry.

Chemical Analyses	Untreated	Ferrocarbo® Treated
TC	3.51	3.54
Si	1.91	1.82
CE	4.13	4.15
Cutting speed (ft./min.)	300	300
Feed (in./rev.)	.009	.009
Depth of cut (in.)	.062	.062
Wear Land (in.)	.020	.020
Vol. of metal removed (cu. in.)	42.5	63.0
Weight of metal removed (lbs)	10.9	16.2
Percent improvement		48.5%



* Surface Machinability Improvement
Tool wear tests were conducted with a single point "Carboloy" grade 44A tool on castings machined at commercial speeds. Flank wear was measured with a 20 power microscope.



FERROCARBO Briquettes—the patented cupola additive by CARBORUNDUM®—are widely used by foundrymen to produce sound iron castings with exceptional strength, ductility and hardness properties. Tests have demonstrated that FERROCARBO-treated iron has considerably better machining properties than undeoxidized iron due to structure control and freedom from segregation. High production industries seeking to reduce costs are buying castings produced by the FERROCARBO cupola deoxidation process as an effective means for increasing production through improved casting machinability.

WRITE FOR MORE INFORMATION on how FERROCARBO produces more machinable iron regardless of metal composition. Ask for booklet A-1409, Electro Minerals Division, The Carborundum Company, Niagara Falls, N.Y.

ELECTRO MINERALS DIVISION

The CARBORUNDUM Company

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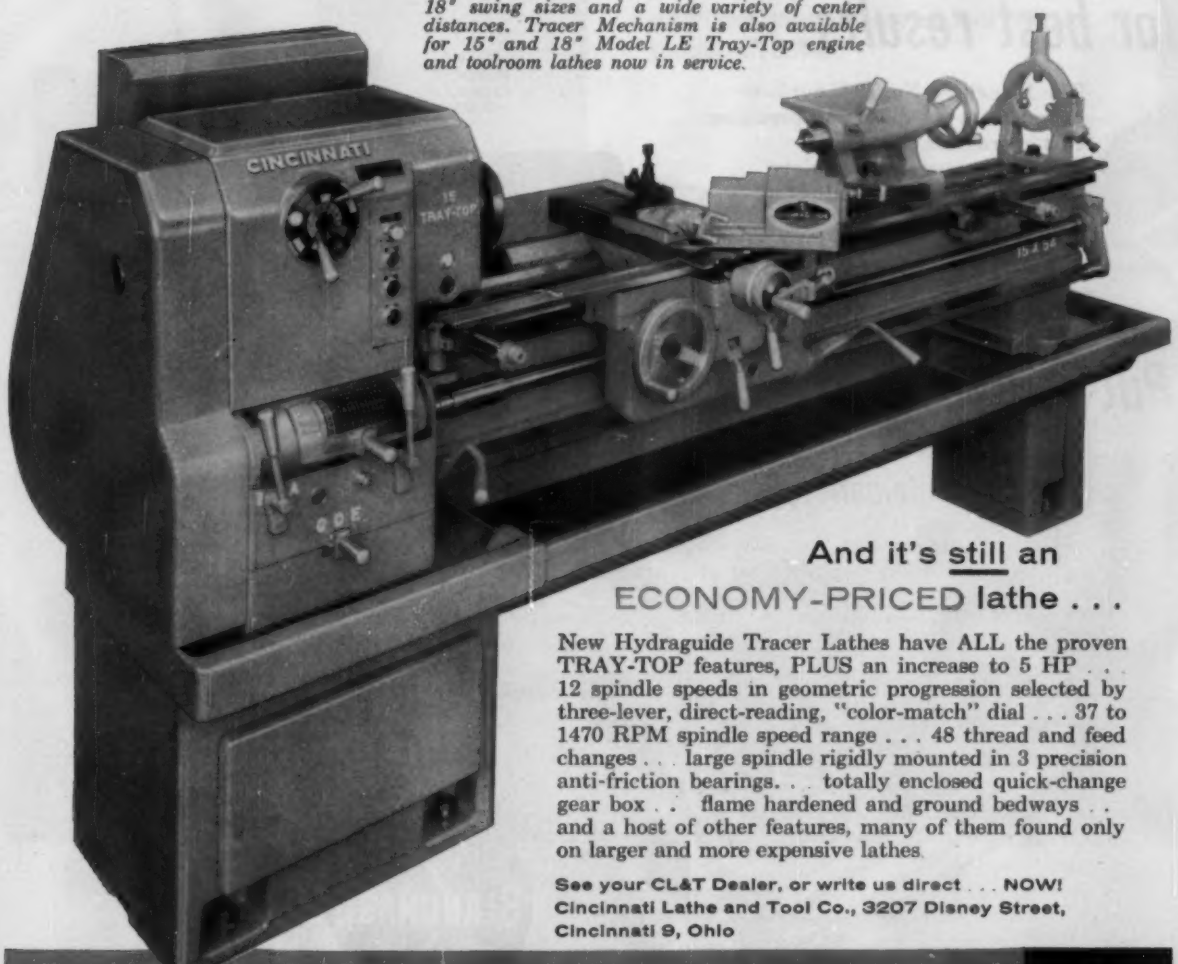
OUT IN FRONT

location of all controls, template and tools on the new

CINCINNATI HYDRAGUIDE TRACER LATHES

provides maximum convenience and safety for the operator, yet does not interfere with standard lathe operations. Just push a single button and you switch to full tracer machining, or back to standard. Compact design has all tracer mechanisms on the carriage . . . no added floor space is required. And the increase to 5 HP gives you greater productivity at every turn!

Hydraguide Tracer Lathes are built in 15" and 18" swing sizes and a wide variety of center distances. Tracer Mechanism is also available for 15" and 18" Model LE Tray-Top engine and toolroom lathes now in service.



And it's still an ECONOMY-PRICED lathe . . .

New Hydraguide Tracer Lathes have ALL the proven TRAY-TOP features, PLUS an increase to 5 HP . . . 12 spindle speeds in geometric progression selected by three-lever, direct-reading, "color-match" dial . . . 37 to 1470 RPM spindle speed range . . . 48 thread and feed changes . . . large spindle rigidly mounted in 3 precision anti-friction bearings. . . totally enclosed quick-change gear box . . flame hardened and ground bedways . . and a host of other features, many of them found only on larger and more expensive lathes.

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Cincinnati Lathe and Tool Co., 3207 Disney Street, Cincinnati 9, Ohio

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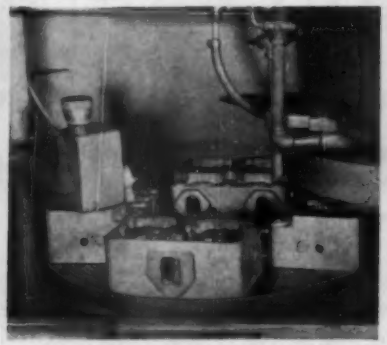
Whatever your grinding job may be...

200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits ± .001".

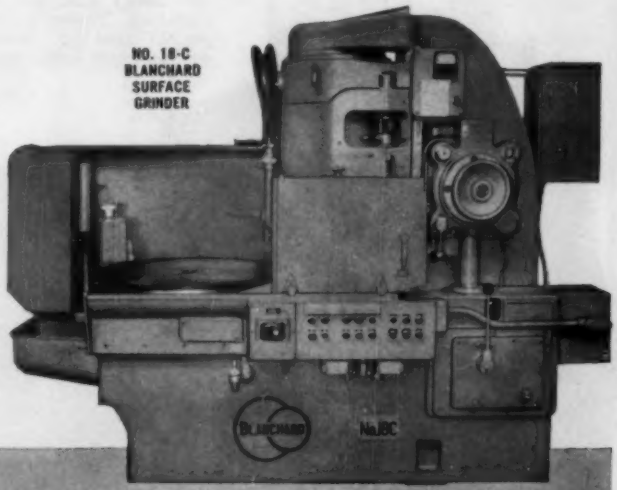


Tops of cylinder heads ground 21 per hour; stock removal 3/16" to 1/4". Bottoms 55 per hour; stock .012"; limits ± .001".

56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

for best results...

The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



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Put it on the Blanchard

The 18-C Automatic Cycle...

Moves chuck to grinding position and starts it rotating

Starts wheel rotation and coolant pump

Provides rapid wheel approach to work

Engages power down-feed at preset rate

Changes to fine feed just before finished size is reached

Stops feed when work is to size—"sparks" out. Raises wheelhead

Stops wheel, coolant pump, and chuck

Moves chuck to loading position—demagnetizes chuck

Can be changed quickly to manual operation

Automatically Controls Size!

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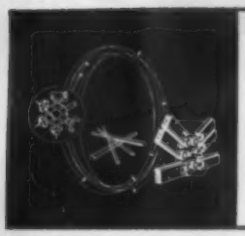
Craftsmen at Staples of Cincinnati have been making finer carbide tools for twenty years and more. Behind each tool coming from the ultra-modern Staples factory is a long standing tradition of superior workmanship—your assurance that a Staples tool will cut production costs.

THE Staples TOOL COMPANY, 2352 Glendale-Milford Road, Cincinnati 15, Ohio



MACHINING ALUMINUM

OPERATOR REPORTS

This report is one of a series by Deo Blott, Technical Specialist, Kaiser Aluminum & Chemical Sales, Inc.

Chip breakers and chip curlers for handling aluminum Alloys

WHENEVER POSSIBLE, it is advantageous to select 2011-T3 aluminum alloy for turning operations. This particular alloy corresponds in machining characteristics to free-cutting brass. When machining 2017-T4, 2024-T4, 6061-T6 and other alloys, some care must be exercised in handling chips.

If the part being made has a number of interrupted cuts, then chips are not a problem. It is possible to notch the form cam on some bar machines to interrupt a continuous cut, although this frequently has some disadvantages. It is only during continuous cutting operations on the heat-treatable alloys—other than 2011-T3—that stringy chips may result. Care must be taken either to direct the chips away from the work or to provide chip breakers or chip curlers in the cutting tool.

Several advantages result in breaking chips. For example, possible build up on the tool edges can be eliminated. There is little danger of marring finished work. Broken chips handle easier and occupy less space. Danger to machine operator, wear on equipment, and chip packing are reduced. Improved chip disposal improves flow of coolant to the cutting edge of the tool.

Chip Breakers for Single-Point Tools

Some of the more common breakers are shown in Figure 1—groove, angular and parallel shoulder types.

TYPES OF CHIP BREAKER AND CHIP CURLER FOR ALUMINUM ALLOYS

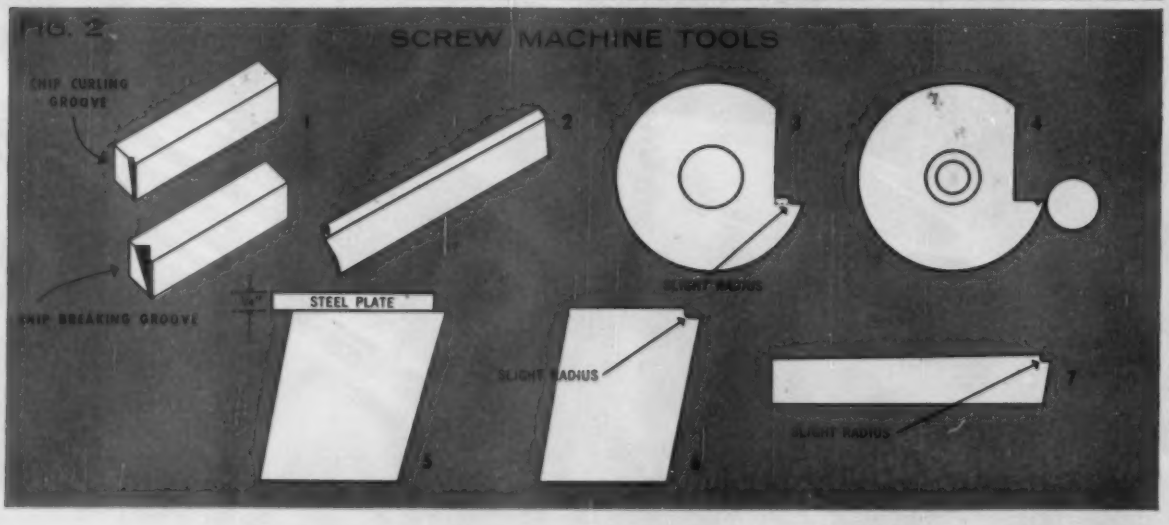
FIG. 1

SINGLE POINT TOOLS (LATHES)

(W: Width; T: Thickness; L: Land; G: Groove)

FIG. 2

SCREW MACHINE TOOLS



The groove type has a recess that is ground into the tool face. The width averages about $\frac{1}{16}$ inch, depth $\frac{1}{32}$ inch, and it is located approximately $\frac{1}{32}$ inch away from the cutting edge. These measurements can vary according to depth of cut, aluminum alloy used, feeds and speeds. Obtaining the correct grind of groove depends largely on cut-and-try or past experience.

In the angular type, the chip breaking shoulder is located back of the cutting edge. The angle varies from 6 to 15 degrees and averages about 8 degrees. Both width and depth may vary. Depth ranges from $\frac{1}{64}$ to $\frac{1}{16}$ inch and width from $\frac{3}{32}$ to $\frac{7}{32}$ inch. If the cutter nose radius is large, the shoulder at this point can be beveled to keep it from coming in contact with the work. Width at the widest point equals about one and a half times the radius of the nose.

Chip Breakers for Screw Machine Tools

The chip breakers and chip curlers shown in Figure 2 are: (1) box tool bit with chip curling groove and box tool bit with chip breaking groove (the narrower the groove the tighter the chip coil); (2) cutoff tool with chip groove or dimple ground with a pencil grinding wheel (will do an excellent job of breaking chips); (3) circular form tool with step-type chip breaker; (4) circular form tool with V type chip breaker; (5) dovetail form tool with chip breaker plate clamped on tool; (6) dovetail form tool with ground chip breaker; (7) flat form tool with ground chip breaker.

* * * *

The tooling information presented above was condensed by Deo Blott from Kaiser Aluminum's library of helpful, detailed screw machine information—available to screw machine operators on request. For example, if you would like a handy stock calculator for aluminum screw machine parts, please use the coupon below to request the "Kaiser Aluminum Quantity, Weight and Footage Calculator."

And to further help you machine aluminum effectively, Mr. Blott will go to your shop to recommend practices proved best by operators experienced in aluminum. Mr. Blott has been machining aluminum on automatics since 1934, and is an acknowledged authority on using aluminum in screw machine operations.

For this advisory service or for information, contact Kaiser Aluminum or see your Kaiser Aluminum distributor.

Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum & Chemical Corporation
Box AM-12, Industrial Adv. Dept.
919 N. Michigan Ave., Chicago 11, Illinois

Gentlemen:

Please send me, without obligation, the "Kaiser Aluminum Quantity, Weight and Footage Calculator."

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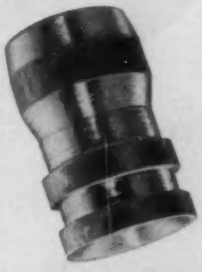
AN ALUMINUM COST STORY

ELECTRIC AUTO-LITE COMPANY, an important supplier to the automotive industry, had traditionally used brass for the spark plug parts shown below. But when they converted the parts to Kaiser Aluminum, they got this "new look" in low costs:

Electric Auto-Lite part #4-00132, Spark Plug Terminal

23.8%

SAVING per 1000 pieces when converted from brass to Kaiser Aluminum*.



Electric Auto-Lite part #4-00129, Standard Spark Plug Terminal

37.1%

SAVING per 1000 pieces when converted from brass to Kaiser Aluminum*.

*Savings based on metal prices current when the conversion was made.

These two conversions demonstrate how easy it is to save with aluminum. In each case, aluminum met the principal operator requirement—*machinability*. (The parts were converted with virtually no change in machining speed and setting.) And aluminum met the principal management requirement—*savings*.

To help operators introduce savings like these for the parts they produce, Kaiser Aluminum offers expert on-the-job technical assistance plus complete, up-to-date information on machining aluminum. Send the coupon today for your free copy of the "Kaiser Aluminum Quantity, Weight and Footage Calculator"—a handy slide-rule type device to help you quickly determine amount of stock needed for any aluminum screw machine part.

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Letters...

To American Machinist
338 W 42nd St, NY 36, NY

Automation

Dear Sirs:
Regarding your Special Report on "The Impact of Automation" (*AM*—Oct 21 '57, p165), here is our experience.

For our company, automation is a must, since we have to compete, in most of our products, with imported goods . . . whose direct labor costs and related overhead expenses are but a fraction of those prevailing in the United States. Shortly after World War II, we set up a three-point program to deal with this problem:

1. Automation
2. Standardization of raw materials used
3. A well-designed and liberal incentive system.

The results of this program proved very gratifying. Despite the fact that direct labor costs have doubled since 1949 and the cost of raw materials has increased by about 65% during the same period, we are able to sell better merchandise at prices 5 to 10% lower than in 1949 and still retain the same earning ratio. By far the most benefits were derived from automation, and we are still applying it wherever it is feasible, either in already established operations or in the production of new items.

Michael Markman, *President*
American Tack Co, Inc
Suffern, NY

Ultrasonic generator

Dear Sirs:
We should like to be furnished with the name and address of the firm which manufactures the Sonogen APT-100-B generator used in the cleaning unit described in "Ultrasonics clean really clean" (*AM*—Sept 23 '57, p145).

Harry Korn
Gardena, Calif

The Sonogen generator is manufactured by Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn—Ed.

Aid to education

Dear Sirs:
We are taking this opportunity to thank you for your timely editorial which was titled "No Job

SHOPMATES

N. Jarvis

HEY CHIEF!! Y'KNOW THOSE REAMERS YOU ASKED ME TO GRIND UP?? WELL-- I GROUND 'EM UP!!
THAT NEW KID MUST THINK THE WHIP IS A HUMORIST!!
WHO SAYS HE AIN'T?? HE'LL LAUGH ALL THE WHILE HE'S BEATIN' THE KID'S BRAINS OUT!!
HE GOT THAT PILE OF DUST OFF'N A GRINDER.... WHEN THE WHIP FINDS OUT IT'S A JOKE HE'LL REALLY GET SORE!!
CRUNCH
N. JARVIS

Uses one soluble cutting oil for class 4 steel, all other jobs!

Precision Parts made from hard alloy steels and other metals have brought an excellent reputation to Industrial Machine & Engineering Company. All are cut with Cities Service Chillo T Oil.

Plant Manager Steven Peti pioneered 10 years ago in use of soluble cutting oil for tough steel cutting jobs. Chose Cities Service Chillo T Oil after much experimentation with water solubles.

Whether it's brass, bronze, steel, or aluminum—and whatever its degree of hardness—Industrial Machine & Engineering Company cuts it with ease using Cities Service Chillo T Cutting Oil.

"In fact," says Plant Manager Steven Peti, "we've been doing it successfully for the past ten years. Of course, it wasn't easy to find the correct oil for all these jobs—and many people said a soluble oil couldn't possibly handle them all. But after considerable experimenting, we found that Cities Service Chillo T Cutting Oil not only could handle them, but save money in the process.

"Today, we have a shop completely free of smoke (some change from the old days when we used sulphur chlorinated oils) and never have to change oils for any job.

"In addition, we have found the oil has excellent extreme pressure qualities, an effective anti-rust inhibitor, and is a fine lubricant. Partly because of Chillo T, we've gained an excellent reputation for cutting precision parts from 347, 321, and 410 stainless steel, as well as 8740, 4130, and 4340 alloy steel. Naturally, we're mighty happy to do business with Cities Service."

Again and again, where there's a cutting problem, the answer lies in one of the Cities Service Chillo Cutting Oils. Find out which of these oils best suits your needs. Call in a Cities Service Lubrication Engineer, or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

SPEED-MARKS 12,000 PIECES PER HOUR ... Automatically

Tooled for high production marking of small metal parts (12,000 pieces per hour), Model 347 illustrated above, is a good example of Noblewest's ability to keep ahead of industry's demands for constantly higher marking speeds at lower cost. Featuring a hopper and dial feed combination, parts are fed to the machine by the hopper, marked and automatically ejected. Spring pressure controls the depth of the mark and insures uniform depth of mark from piece to piece regardless of slight variations in diameter. Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete catalog write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

More Important" (*AM*—Sept 23 '57, p119). This editorial is so appropriate and covers the nuclei of a constantly growing problem of our security and the transitional social order.

We have used *American Machinist* at this school for many years as a valued supplement in our machine course, and while it has been appreciated, we have not prior to this contacted the editorial staff to express our regard.

After many years in the industrial educational field, and coming from industry into education, I have been increasingly aware of the growing gap in our educational system that should be, and could be, filled with the correct type of industrial technical school.

Many schools such as ours, privately endowed and non-profit, due to the very nature of endowments, are becoming less and less able financially to keep abreast of the technical advances in production tools, equipment, processes, and the science of precise measurement and control.

This problem is two-fold. One, students are more prone to attend schools that, under present laws, can obtain their military deferment while their educational investment is completed. This reduces the student body potential in the age group most readily adaptable to technical training.

Two, the alert student who earnestly seeks technical knowledge of the many phases of in-

Helpful Henry

by L. Hoppes

"Well anyhow we got it open!"

dustrial progress has to weigh carefully his selection of the educational unit which offers the most advanced tools of learning. Finances prevent many fine schools from offering these tools.

As the industrial technical school is truly a servant of industry, and one upon which industry will lean more and more, your statement, "An equal responsibility will rest upon industry to give its financial and moral support to our educational institutions in this terribly important endeavor," certainly should awaken the far-seeing members of our more advanced industrial organizations.

N S Buckman, *Director*
J M Perry Institute
Yakima, Wash

CALENDAR

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual Meeting and Display, Jan 13-17, Sheraton Cadillac and Statler Hotels, Detroit, Mich.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION — Winter Meeting, Feb 5-8, Ambassador Hotel, Los Angeles, Calif.

AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION — Spring Meeting, Mar 10-11, Hotel Roosevelt, New Orleans, La.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS AND AMERICAN ROCKET SOCIETY—Joint Aviation Conference, Mar 17-20, Hotel Statler-Hilton, Dallas, Texas.

SOCIETY OF AUTOMOTIVE ENGINEERS—Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS—Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY—Spring Meeting and Welding Show, Apr 14-18, Statler Hotel, St Louis, Mo.

AMERICAN SOCIETY OF TOOL ENGINEERS—Tool Show, May 1-8 (closed Sunday), Convention Center, Philadelphia, Pa.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION — Spring Meeting, May 3-6, Statler Hotel, Washington, DC.

AMERICAN SOCIETY FOR METALS—Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, June 15-19, Hotel Statler, Detroit, Mich.

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Provide Full Diameter Range To Maximum Capacity

A multi-purpose tool of wide range for rolling machine screw threads, straight and taper pipe threads (including dryseal), annular rings, oil grooves, knurling and other cold forming operations. Eliminates secondary operations by rolling behind shoulders.

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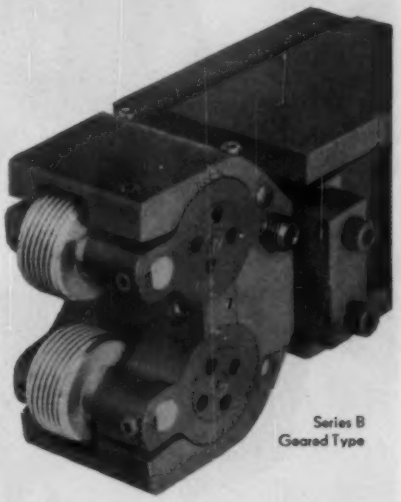

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FIVE STANDARD SIZES CARRIED IN STOCK

Model No	Complete Diameter Range	*Pipe Threads That May Be Rolled	Approximate Number of Common Screw Threads That May Be Rolled
B 8	0-1/2"	5	70
B 10	0-5/8"	7	80
B 13	1/8"-13/16"	9	90
B 18	1/4"-1 1/8"	15	105
B 36	3/8"-2 1/4"	18	185

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary.

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New sturdier construction! New heavier jacket! Improved Sealtite* E.F. offers new superior performance in equipment . . . new installation ease. No extra cost!

Sealtite Type E.F.†—the original flexible, liquid-tight conduit, first to meet J. I. C. standards—is now better than ever. New design has made it stronger, tougher, more durable in service . . . easier to install.

Over-all construction is improved. Heavier extruded PVC jacket offers greater resistance to abrasion, cutting and tearing . . . greater oil resistance . . . greater holding power for fittings.

It is more flexible—permits smaller bending diameters. New convenient markings save time, prevent waste. Length is indicated by arrows at 1-foot intervals. Trade size in inches is also shown on cover.

Available in handy cartons, or nonreturnable reels,

STRONGER. Over-all construction is stronger, more durable.

TOUGHER. Thicker PVC jacket resists abrasion, cutting, and tearing.

MORE OIL RESISTANCE. Liquid-tight jacket keeps out all foreign matter.

GREATER HOLDING POWER FOR FITTINGS — easier attachment.

GREATER FLEXIBILITY — smaller bending diameters — smoother cover even when flexed.

NEW MARKINGS — length and trade size are indicated at 1-foot intervals.

Sealtite E. F. flexible, liquid-tight conduit

at no extra cost. Reels simplify handling and cutting, reduce scrap, simplify storage, have handy charts for a running inventory.

Sealtite types E.F. and U.A. (U.A. is approved by Underwriters' Laboratories) in both black and machine tool light gray. For information, write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. *Trademark †Pat. Applied For 51239

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AVAILABLE IN 0"-1", 1"-2", and 2"-3" SIZES
with and without clamp rings and ratchet stops

WRITE FOR FULL DETAILS on this high-quality, lower-cost line. Brown & Sharpe Mfg. Co., Providence, R.I.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe B·S

announcing

Programming by numerical control for Fosmatic Jig Borers

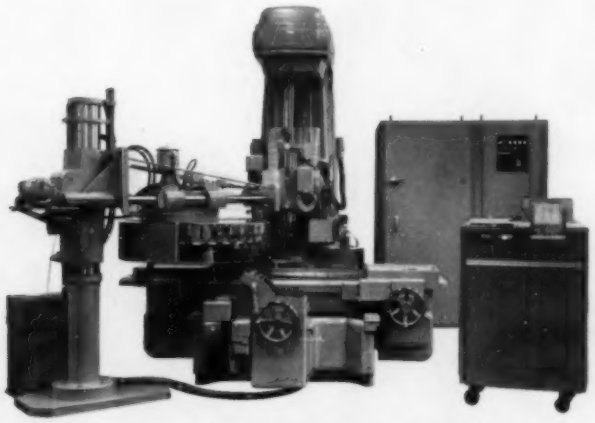
One important objective of automation is to remove unnecessary steps and human decisions which occur between production engineering and finished product. Stated another way—to keep control of important manufacturing operations in the hands of qualified technical experts. To this end, The Fosdick Machine Tool Company and the International Business Machines Corp. have adapted numerical control to all functions of Fosmatic Jig Borers. As a result, any jig boring operation can now be completely programmed and controlled by punched cards or tapes. Once the work piece is loaded on the jig borer, the following functions can be controlled completely automatically: Table and Saddle Locations · Spindle Feeds and Speeds · Feed Depth · Spindle Head Height · Automatic Tool Changing.

Dimensions, feeds, speeds, etc. are charted by the Production Engineering Department, then tape or cards are punched (a simple clerical procedure).

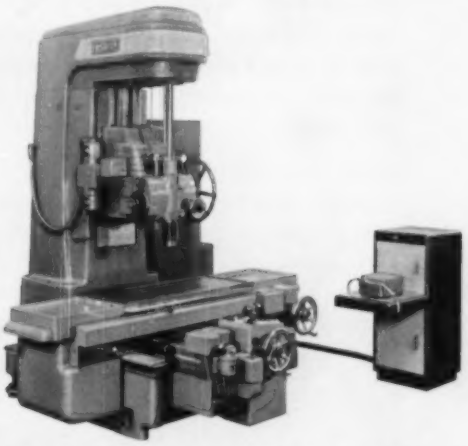
Optimum programming can be achieved by using an automatic computer which will establish the best possible sequence of operations.

Many plants, of course, are not yet ready for the total automation just described. They do, however, face problems of precision, production rate, efficiency and quality control which can be partially or wholly solved by automating one or more of the above functions. In effect, we offer exactly the degree of boring automation your plant is ready for.

A meeting with your Fosdick representative will help you quickly determine just how these dramatic new methods can best serve your production needs.



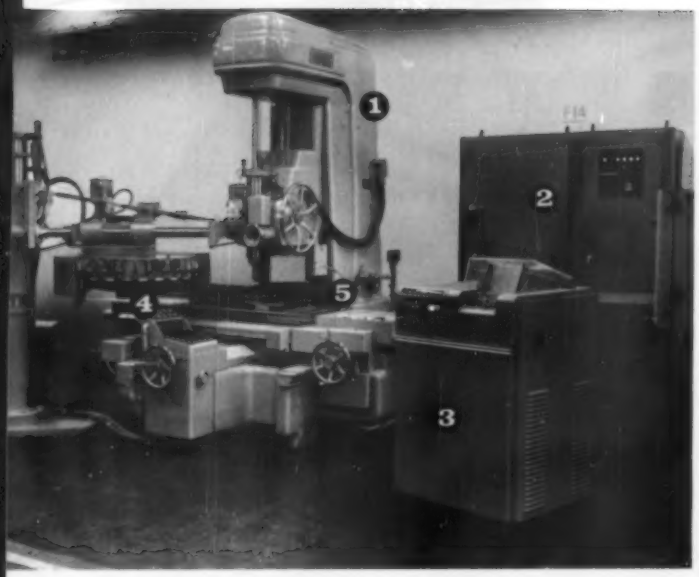
IBM card-controlled Fosmatic Jig Borer programs table and saddle location, spindle feeds and speeds, feed depth, head height and tools.



Tape-controlled Fosmatic Jig Borer built for the General Electric Company, Aircraft Gas Turbine Division, Production Engine Department.

erse screw is relieved by reversing it slightly

mately 1/16" from the surface of the work



1. Fosmatic Jig Borer
2. Control Panel
3. IBM Card Reader
4. Automatic Tool Changer
5. Automatic Hole Depth Control

Numerical control on the Fosmatic Jig Borer, gives

Exactly the degree of boring automation your plant is ready for.

By controlling numerically one or more—or all—of these functions on your Fosmatic Jig Borer, you can accomplish exactly the kind of boring programming that fits best into your present operation.

By controlling table and saddle location, you will establish definite work sequence. This, of course, can be worked out by your production experts to give optimum efficiency—eliminates leaving these important decisions up to the operator. By adding the other numerically controlled functions you can assure that those functions are performed without possibility of error or lost time. These advantages apply to single piece jobs as well as to precision production runs. In both cases, the result is lower cost per piece.

A considerable savings in set-up time can be realized with this equipment when compared with other methods of doing small and medium production runs. Only a single setting on the workpiece in each direction of table travel is required. Since set-up time is very short, real savings in inventory can be made. And greater flexibility in scheduling can be achieved through use of shorter production runs.

In many situations, jigs and fixtures are eliminated, with their high cost and long lead time.

Shown and described here are the five basic jig borer functions which can be numerically controlled. They are available individually or as a group and are recommended in the order discussed.

Numerical Control of Table and Saddle Location. This basic control automatically locates the workpiece under the spindle within ±.0001 of the specified dimension. For measurements along the X and Y coordinates, a series of Class A measuring gages are lined up. There are gages in even tens of inches, gages in increments of one inch, gages in increments of tenths of inches and so on down to increments of .0001 inch. These gages are selected through motor-driven drum dials so that they are placed end to end to provide the required dimension.

Movement of the table stacks the gages and moves them to operate a switching mechanism. At the point of final position the table movement is stopped, the trav-

Measuring gages locate table to ±.0001".

erse screw is relieved by reversing it slightly and the table is clamped.

The numerical control of coordinate locations consistently reduces the time required per piece. The table automatically proceeds from one location to the next as each operation is completed without any lost time. Even on a machine equipped with numerical control of only table and saddle, the table will reach position before the operator has changed tools. This feature will also bring about improved quality of the parts being machined by eliminating operator errors. Table locations will always be accurate to ±.0001".

Numerical Control of Spindle Feeds and Speeds.

Additional time can be saved through automatic control of spindle feeds and speeds. This is accomplished on the Fosmatic Jig Borer through magnetic clutches in the gear trains. Speed and feeds are changed instantly from information stored on the punched cards or tape. When this feature is added to numerical control of the table and saddle, the feeds and speeds are changed as required with absolutely no loss of time. Correct feeds and speeds assure required finish and accuracy of hole diameters.

Numerical Control of Spindle Feed Depth.

This is another time saving feature that can be applied to the Fosmatic Jig Borer. The correct depth is held within .002 inch every time, eliminating operator errors.

In operation, the spindle is advanced in rapid traverse and shifts into the desired feed rate when the cutting tool is approximately 1/16" from the surface of the work piece. The spindle then feeds down to the prescribed depth where feed and rotation are stopped and the spindle is retracted.

Spindle rapid traverse is controlled by a photoelectric unit. As the tool moves down, it passes through a beam of light; this energizes an electronic counter which allows the spindle to continue to traverse a pre-determined distance. At this point it shifts into cutting feed rate.

When the tool contacts the work, the electronic counter is re-energized by means of a vibration pickup on the fixture to control the depth of feed.

Numerical Control of Spindle Head Height.

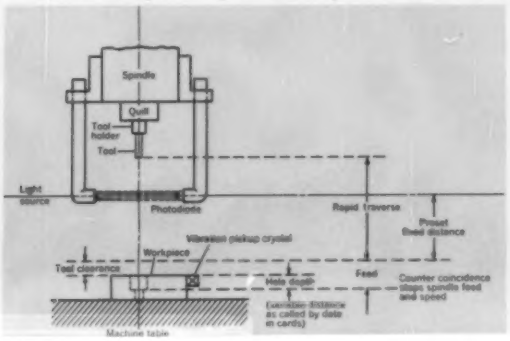
This feature insures that the head is always at the correct height so that even work pieces with hole surfaces with extreme differences in height can be run automatically. The operator's judgment is not required to determine what head positions are required to reach all holes in the part with the spindle travel available. The head will always be at the correct height.

Numerical Control of the Automatic Tool Changer.

Addition of the numerically controlled tool changer to the features previously discussed makes these machines completely automatic. With a capacity of 30 or more tools in the tool rack, the Fosmatic Jig Borer is capable of completing all drilling, reaming, boring, counter-boring and tapping operations in a very wide range of jobs, all automatically.

Each of the tools used in the tool changer

Schematic shows operation of automatic depth control.



Boring tool has been removed from the storage rack by automatic wrench. Spindle will feed down at slow rpm and engage thread until a pre-determined torque is reached.

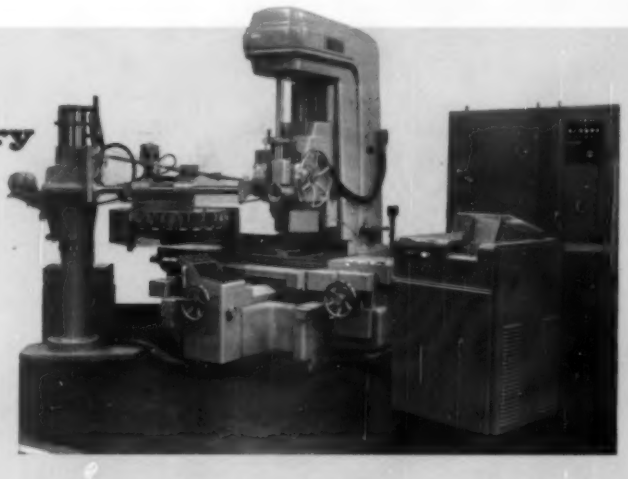
has a tapered shank with a straight external thread at the top of the taper.

Each boring tool is set for diameter in the tool room. Each tool is numbered and is inserted into the tool rack at the corresponding number.

The sequence of events in changing tools is as follows:

1. The spindle is retracted to the top of its travel.
2. The tool rack indexes to the specified location by the shortest route.
3. The tool rack moves radially under the spindle.
4. An automatic wrench mounted under the spindle advances and locks on a hex section of the tool just below the taper shank.
5. The tool rack is retracted leaving the tool locked in the wrench with the shank upward.
6. The spindle feeds down at slow speed and engages the thread at the end of the tool shank.
7. When a pre-determined locking torque is reached, the wrench opens and retracts, clearing the space under the spindle.
8. The spindle feeds down and completes the programmed operation.
9. To remove the tool from the spindle, the spindle is retracted to the level of the wrench and the above steps, in reverse sequence, take place.

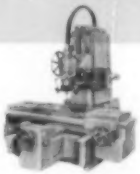
IBM saves on machining and inventory



At Endicott, New York, International Business Machines Corporation uses its numerically controlled Fosmatic Jig Borer in the production of side frames for its data processing equipment.

Thirty operations are performed on each part. Total hole location error in the 16″ by 18″ side frames has never exceeded .0004″.

In addition to the savings in the direct cost of machining, IBM says that the shorter set-up times with the card-controlled Fosmatic permit inventory savings due to reductions in optimum manufacturing orders.



Numerical control by punched cards or tape is also available for the *Moore-Fosdick jig grinders*.

May We Discuss Numerical Control With You?

If you are producing parts with precision holes in any quantity, we'd like to talk to you about numerical control. We will analyze your requirements to see what savings can be made. Just write us with a description of your job.

Need boring equipment? Get a proposal from Fosdick!

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

LITHO U. S. A.

11-57 86.5M-H

Spot news...

- **"Automation soldering,"** a process that combines pure solder powders with special fluxes and neutral binders into a stable paste which is pre-placed in the joint area before soldering with automatic dispensers, has reportedly shown savings of up to 500% over previous production soldering methods. Fusion Engineering Co, Cleveland, says the dispensers can meter the exact amount of paste needed in dots, stripes, or required special pattern. Conventional heating does the rest.
- **Look for a startling proposal regarding manned space flight** to be made to the government within a few days. A major technical organization has developed what it considers a practical long-range plan for sending men to Mars, hopes the government will finance the effort.
- **Evidence that the aircraft industry is holding down spending** in line with Defense Dept efforts to stick to a $58 billion ceiling for fiscal '58: average workweek dropped from 42 hours in April to 40.8 hours in August; average aircraft or parts employee made $99.12 a week in April, by August was making $96.70; between July and August's end 17,300 were laid off.
- **Magnetic metals don't always become more magnetic at lower temperatures,** Ford Motor Co scientists have found. By adding aluminum to iron, Ford has created an alloy that loses magnetic properties at low temperatures, rather than adding them. And, because such alloys are non-corrosive, Ford people believe that a close liaison between rusting and magnetism may exist.
- **Steel mills are reducing minimum tonnage requirements for mill shipments,** in addition to making fast-delivery promises, in effort to get more business.
- **Webless piston pins are being cold-extruded experimentally** at an unrevealed high rate in Germany on a vertical press incorporating a knuckle-joint design. Simca in Paris is cold extruding shock absorber shells in three passes at rate of 1400 pieces per min on same kind of press.
- **Amount of tool and die work ordered in western Europe by U S companies** will be subject of Congressional inquiry if Detroit Local 157, UAW-CIO, has its way. The local charges thousands of workers (including employees of machine tool builders) have been laid off as result of such purchases and that some industrialists want machine tools and dies brought in duty-free.
- **Latrobe Steel's new mill doubles company's capacity** to make tool and superalloy steel billets. Process is 10 times faster than hammer forging, with most alloys being rolled in single pass. In two years Latrobe expects half of its mill tonnage to be in materials not produced five years ago (see p143).
- **Ford, General Motors and Chrysler are making informal visits** to machine tool builders to get their reaction to advantages of producing building-block machines. Ford is spearheading the campaign. The Big Three stress that they do not want to dictate machine design to builders. See p89 for story.
- **"Telephotomation" is the name given a new analog system** for automatic numerical control of machine tools produced by Maxnovo Co in Italy. System uses photo-electric cells and a punched-card memory. Only one impulse per dimension is needed to operate the system.

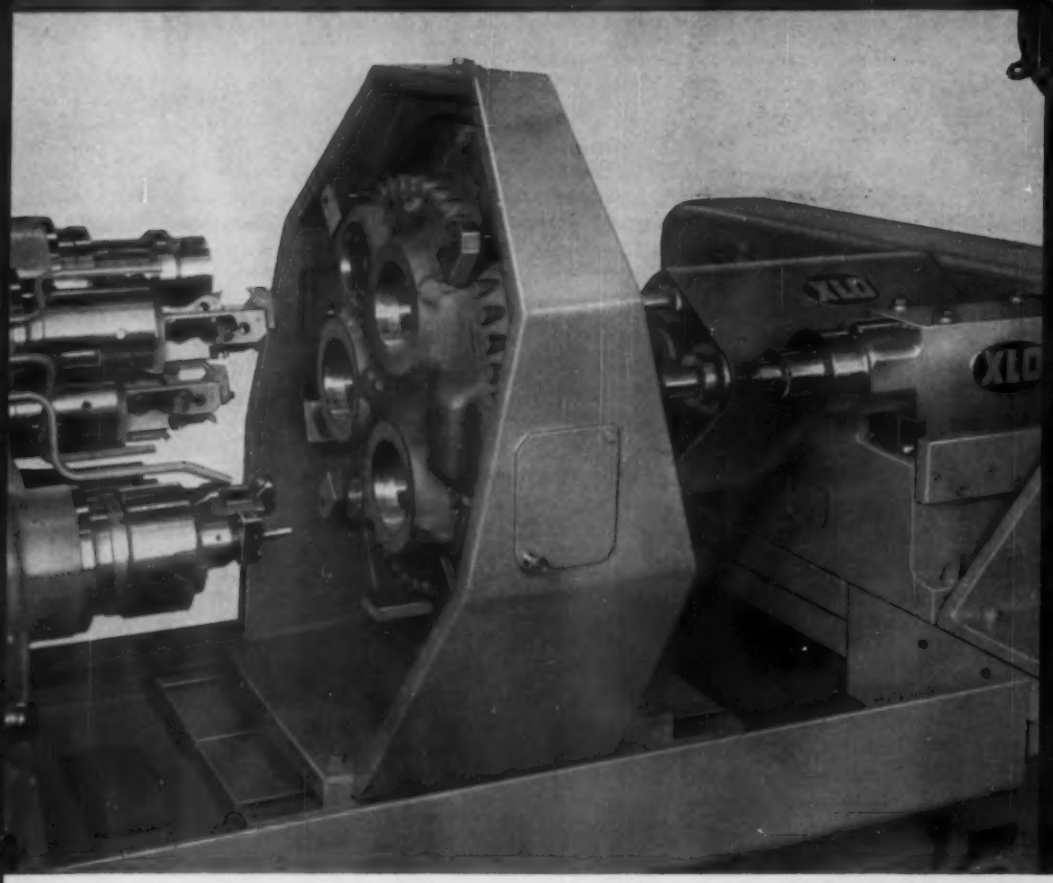
Spot index to major News stories...

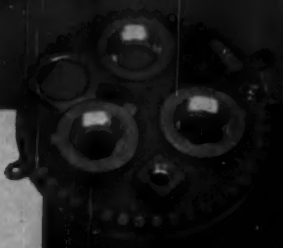
Tight Defense Pursestrings Loosen 138
Bargaining Will Be Tougher in '58 139
U S Still Leads World in Machine Tool Output—
But the Gap Is Closing 140
Contour Machining Conference 142
Field Report 144
Names in the News 147
Washington 83
Detroit 85
Aircraft & Missiles 87
Machine Tools 89
What's Ahead
in Metalworking 91
in Business 92
Surplus Machinery
Market 245

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

LITHO U. S. A. 11-57 86.5M-H

How to precision finish 42 surfaces in one cycle





Back and front view of the bored casting. Part will eventually house a precision gear train. All hole sizes and locations are held to .001" tolerances.

Close-up of part mounted in its hydraulically-operated fixture. Notice straddle facing tools mounted on boring spindles.

XLO

EX-CELL-O FOR PRECISION

57-70

These magnesium cast aircraft gear housings are being bored, faced and chamfered, 42 precision operations overall in one cycle on a single Ex-Cell-O 17-A precision boring machine! What's more, all diameters and locations are being held to .001" tolerances.

The ability of this and other Ex-Cell-O boring machines to perform multiple precision operations is recognized throughout the metalworking industry. This reputation, backed by years of leadership, is your assurance that precision boring is best done by an Ex-Cell-O machine.

For full information on the complete line of Ex-Cell-O precision boring machines, including the one best suited to your production standards, get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

EX-CELL-O CORPORATION *Machinery Division*

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Washington ... NEWS REPORT

Easier credit for...

business borrowing is the big talk of Washington. For months now, the administration has been letting it be known that it felt the Federal Reserve Board—an independent agency—might be carrying on its fight against inflation too long.

The administration feared that the Federal Reserve—by holding to its tight money policy too long—might actually start business into a slide that couldn't be easily turned around.

The Federal Reserve Board—with sole authority over regulating the nation's money supply—has been saying that inflation was still the number one threat, and that it would stick by this line until it saw signs that the water had been squeezed out of prices, and that prices were actually coming down.

Now, the Board has come around to the administration's view—at least partially.

Lower interest rates...

are now being charged the bankers when they come to the Federal Reserve Banks for money—that is, the wholesale price of money has been cut. The lower discount rate (a drop from 3.5% to 3%) can have a powerful psychological effect, the Washington economists hope.

It tells businessmen—they hope—that Washington's top economic bosses are coming around to the view that all is not well with the business outlook, and that Washington decisions are being made to do something about it.

The impact of this is admittedly mainly psychological. It should have its impact on investors who have been waiting to see if interest rates are still going higher.

On the other hand, the move does nothing to actually pump up the money supply—although there is some incentive to the banks to see whether they find room in their position to come to the Federal Reserve to get some of the cheaper money. Presumably, they are still finding more customers at the loan windows than they can satisfy.

Defense spending rise...

won't be felt in a wave of orders running through the metalworking industries (see page 138 for the story on defense spending). Again the administration's turn-around—the breakthrough on the Pentagon's $38-billion spending ceiling—is mainly psychological.

The sign is clear and unmistakable—the administration is now leaning on the side of more military spending, rather than less. No one expects the talked-about cutbacks to offset the increases in arms spending.

Again, this move, taken with the Federal Reserve's turn-around on money policy, should give a new lift to businessmen whose view of the business outlook has been getting dimmer and dimmer.

Tooling-up for defense speedup...

As a possible tipoff to new defense emphasis on telescoping development time for advanced weapons, the Air Force has awarded General Dynamics' Convair Div a $12.5-million contract to buy long lead-time items—machine tools and aircraft systems like navigation—in advance of ordering volume production of the company's B-58 supersonic medium bomber. Right now, production contracts cover output of only 31 planes for evaluation tests.

Meanwhile, the decision is still pending on which of the rival IRBM's—the Army's Jupiter or the Air Force's Thor—will be ordered into quantity production. Continued development testing—at an estimated cost of $10 million monthly—is under way to provide a basis for the production decision.

Pentagon insiders say that Douglas, the Air Force's Thor prime contractor, is already tooled up for quantity production. This has been accomplished, they say, under the Air Force's policy of "laying down" a complete weapon system plan when it starts a major development project—to include even production tooling.

On the other hand, Chrysler, the Army's Jupiter IRBM prime contractor, is still not tooled up for quantity production. Army Ordnance's Redstone Arsenal at Huntsville, Ala., where Jupiter development has been largely carried out, is tooled up for limited production of the missile. It has been turning out the prototype models for testing. The upshot is that Thor—though still not necessarily proven out as a superior missile to the Jupiter—can start rolling off the production lines earlier.

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Detroit ... NEWS REPORT

Reason for optimism ...

Economic pundits, generally doleful of late, are still leaving one light burning in the window; namely, unexpectedly good auto sales in 1958.

Early retail returns, more of a barometer than production at this point, are starting to come in and for some makes, they look mighty good. Chevrolet General Manager E N Cole says: ". . . the 1958 model introduction was the most successful in our history. Orders taken in the three-day period totaled 103,669 units. The enthusiastic reception means a continuation of overtime at most Chevrolet plants throughout the last quarter of the year."

Lincoln's expensive Continental Mark III was a complete sell-out in Chicago, Denver and Detroit. 2700 sales were made throughout the country in an initial two-day period, according to Sales Manager Joseph E Bayne. Eastern and Midwestern De Soto dealers told factory sales executives that 1958 sales would be higher.

Ford Division's General Manager J O Wright reports that his first three days were 29% higher than last year, totalling 22,408 units. Pontiac sold over 11,000 cars on its first day. Imperial deliveries during the first 10 days of November were 315.4% higher than the like period in 1957.

Total new car sales are averaging 18,000 units daily, the highest level reached for this time of year since 1955. However, the termite in the adding machine is the legitimate speculation that as much as 40% of these sales could be leftover '57 models.

Increased output or speedup?

For more than a year, Chrysler has been reviewing and re-shaping every conceivable manufacturing operation to get production costs more in line with those at GM and Ford—former Ford men have been running the program at the working level. The result has been more work demanded of men and machinery.

In UAW eyes this spells speed-up and to Walter Reuther it means an automatic strike authorization. Heading into production of 1957 models, Chrysler had trouble with UAW over its new work standards, and this year has seen a repeat performance. First was the threat of a strike at Chrysler body plants; then the latent explosiveness of the issue did erupt into a strike at the Plymouth engine plant two weeks ago. Observers expect a chain reaction in Chrysler plants throughout the country. The attitude of both sides is best described as militant.

Independents' pocketbooks ...

American Motors President George Romney reports that his company netted over $1 million during October, and left unspoken his firm faith that red ink would not be needed for the rest of the fiscal year. The first 100-in.-wheelbase Rambler, "American," will come off Kenosha assembly lines on December 2, and by March 1958 production of all models should reach 800 a day.

Studebaker-Packard, on the other hand, reported its loss for the first nine months of 1957 as over $12 million on sales of over $147 million. The company still has about $30 million in its kitty, but somebody had better build a dam in South Bend and soon.

Italians losing their touch?

Top stylists from General Motors, Ford, and Chrysler attended the recent Turin, Paris, and London auto shows and came home frankly disappointed. One of them said: "We saw lots of interesting details but no new concepts. The Italian school is not keeping up with its early post-war leadership; everything is a variation of the same old theme."

It looks as though Pinin Farina, Ghia, et al, can expect fewer dollars for Detroit-ordered prototypes unless they strike a quick match under their collective genius.

Window shopping ...

Reports of Chrysler interest in various European auto makers are both wide-spread and well-founded. However, most accounts have failed to spell out the project's exploratory nature.

As of November 20, 1957, Chrysler honestly does not know what it will do—if anything—even though at this time there are several teams out on overseas scouting expeditions. They are there to evaluate all the possibilities, good and bad, and have no authorization to negotiate a purchase or merger. Chrysler's current interest lies wholly in the European market, not in the importation of a car to the United States.

No help to gas stations ...

In line with today's Detroit emphasis on economy, Plymouth engineers report top results for their "fuel-saver" automatic choke, optional without extra cost on all V-8 models this year. In two-, five-, and fifteen-mile test runs starting from cold, a car so equipped beat one without the device by better economies of 42, 23, and 10% respectively.

RADIAL DRAW

Forming . . .

the big missile shapes

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Aircraft and Missiles...

NEWS REPORT

Pentagon missile shakeup . . .

The Defense Dept is carrying out President Eisenhower's order to bolster the powers of William M Holaday and to set up "single managers" outside the service organizations for new missile projects.

Holaday's title has been changed to Director of Guided Missiles, and his responsibility has been broadened to cover procurement of operational weapons and jurisdiction over all guided missiles.

Defense Secretary McElroy explains that Holaday will have no direct budgetary functions—a must for an official who can "knock heads together." Nor will he have power to negotiate or cancel missile contracts. Observers are skeptical over his new powers and claim that he will continue to be a coordinator with little authority to push policy decisions through.

Nevertheless, he'll be looking over the services' shoulders more closely than before and should be closer to the Defense Secretary's ear.

Single Managers . . .

McElroy's plans call for "single managers" to oversee development of future missile and satellite projects. These would include the anti-missile missile, reconnaissance satellite, space vehicles, and other projects outside the traditional missions of the three services.

The single manager will be directly responsible to the Defense Secretary, outside the service organizations, and not associated with Holaday's function. He will have authority to let contracts and supervise development.

Anti-missile missile . . .

The Army is urging the administration to make an all-out effort to produce an operational anti-missile missile by 1961 at an estimated cost of between $6- and $7 billion. This proposal has been made to the Joint Chiefs of Staff and to Defense Secretary McElroy by the Army Chief of Staff, General Maxwell D Taylor. The ultimate aim of this 3-yr program is to develop a weapon capable of destroying the Soviet ICBM. The plan is opposed by several influential Air Force officers.

Commercial field is strong . . .

Commercial aircraft business has been unaffected by Washington cutbacks and stretchouts.

Douglas' commercial business accounts for about 50% of its $1.9 billion backlog. Well over half of the commercial backlog is accounted for by the DC-8. Orders are up to 124; first deliveries are scheduled for late 1959. Some 2500 people are employed on the DC-8 at Long Beach. This direct employment will rise to 10,000 at full production. Douglas has orders for 143 planes in the DC-6 and DC-7 series, but production is expected to taper off during the next year.

Lockheed's commercial backlog is not as large, nor as great a percentage of its total, as Douglas', but it is substantial—$360 million out of $1.3 billion.

Lockheed's long-range successor to the Constellation series—the Skyliner—will wind up next year. It owes its short career to timing—it arrived just in time to be squeezed out by the jets and propjets. Orders are still being taken on the 1049G and 1949H Constellations, but production—which has been at a high level this year to permit a company record in commercial deliveries for the first three-quarters—is tapering off. It will continue at "a modest level" for some time yet—depending, of course, on continuing orders. Meanwhile, the Electra propjet is coming on strong. First one is out and will probably be in the air before the scheduled Jan 31. First delivery is scheduled for Oct 1958. There are already 6400 people employed on the Electra project. This figure is scheduled to reach 8000 by the end of next year and rise to a high of 8500-9000 in mid-1959, when production reaches 10½ planes per month.

Subcontractors will perform 15-20% of Electra fabrication work. Major subcontractors are Rohr —power plant nacelles and tail pipes; Temco—ailerons, wing leading edges and flaps; and Monasco will handle the landing gear assembly.

If the Air Force decides to buy the 10-passenger Jetstar, Lockheed will have another commercial entry. The plane was built on speculation in response to an Air Force expression of need for an off-the-shelf plane to double as a combat readiness trainer and utility transport. The company is pleased with Air Force reaction to the plane, which was rolled out in August after establishing speed records for design and fabrication. Should the Air Force accept the plane, Lockheed will undoubtedly put the Jetstar on the commercial market as an executive plane.

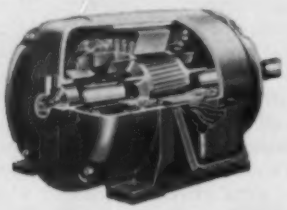
North American may enter the commercial field by way of response to an Air Force request for a similar but smaller 4-8 passenger plane. The North American Saberliner, which will be in the air some time next summer, is being built within CAB regulations, with a definite eye on commercial sales if Air Force orders justify production.

If the Jetstar and Saberliner materialize, the two companies will be entering a field that is growing rapidly into a considerable effort. According to the Aircraft Industries Association, 404 one-to-ten-place utility and executive aircraft—representing $7 million in net billings—were sold during the month of September. Total value of the active fleet of general aviation—as distinct from airlines—is now in excess of $700 million, according to AIA.

TWO WAYS...with Master Unibrakes

STOP-HOLD—Master Type M Magnetic Unibrake Motors. For quick, controlled stopping—especially when you want to hold the load. Spring-setting magnetic release brakes of the friction disc type combine with motor in a compact, integral unit. Sizes—⅛ to 150 H.P.

ROLLING STOP—Master Type D Dynamic Unibrake Motors. Braking is obtained with a unique, patented brake winding superimposed on the stator winding. Simple, compact, with no DC current required, the brake has no moving parts. There is nothing to wear or adjust—braking torque repeats consistently. Particularly recommended for automatic applications which do not require static holding. Sizes up to 30 H.P.



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Machine tools ... NEWS REPORT

Detroit pushes building-block idea...

The automotive Big Three are deep in a long-term program to educate both machine tool builders and users in the advantages of so-called building block machine tools.

Ford, General Motors and Chrysler men are making informal visits to machine tool builders to get their reaction. Ford has prepared the data to be shown on these visits, with slides illustrating the machine components in which standardization is desired. Only a few builders have been contacted up to now, but eventually a representative group of builders will be covered.

One supplier of hydraulic equipment for machine tools has heard the presentation and has expressed considerable interest.

Four-step plan proposed...

Four steps are involved in the Big Three program. First is the visit to builders. Second is publication of general specifications and recommended standards at Ford for use of Ford personnel.

Third step will be further discussion with builders on a more formal basis, with more detailed standards developed. The final step will be to call a Joint Industry Conference.

All three of the big automobile companies are setting up their own subcommittees to study, develop and consider specifications, standards and other factors involved in building block construction and standardization of production machines.

The idea is to work out concrete suggestions and get a clear understanding of the problems involved so that the three companies will be ready when a JIC meeting is called.

Not to dictate design features ...

None of the automobile people wants to dictate machine design to builders. This point is stressed by Ford, General Motors and Chrysler.

Detroit is fully aware that individual features of machine design are the backbone of the usefulness of individual machines and represent the competitive advantage of one machine over another.

Main purpose is to bring about standardization of only certain machine tool components, such as bases, mounting and attaching pads.

Make no mistake about one thing, however. Ford as the spearhead of the movement is dead serious about the need for standardization, especially in light of defense mobilization needs.

Olivetti to sell machine tools here ...

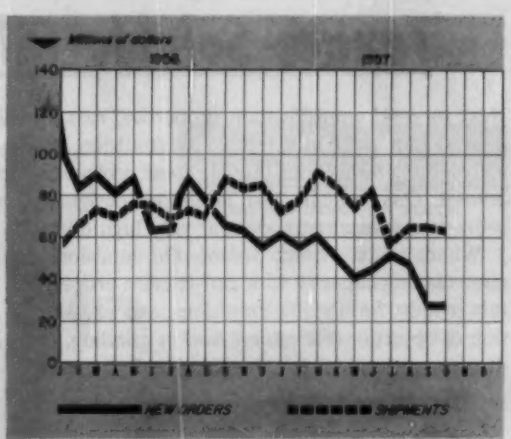
Olivetti Corp of America has established a Machine Tool Division at 42-33 Northern Boulevard, Long Island City, N Y, to market a complete line of sensitive drill presses, as well as drilling and tapping heads and automation units.

The company soon will offer cylindrical grinders, production millers and automatic boring machines. It plans to distribute nationally the entire line of Olivetti machine tools. Olivetti has made machine tools since 1926. Up to now it has been chiefly marketing in this country its typewriters and office machines.

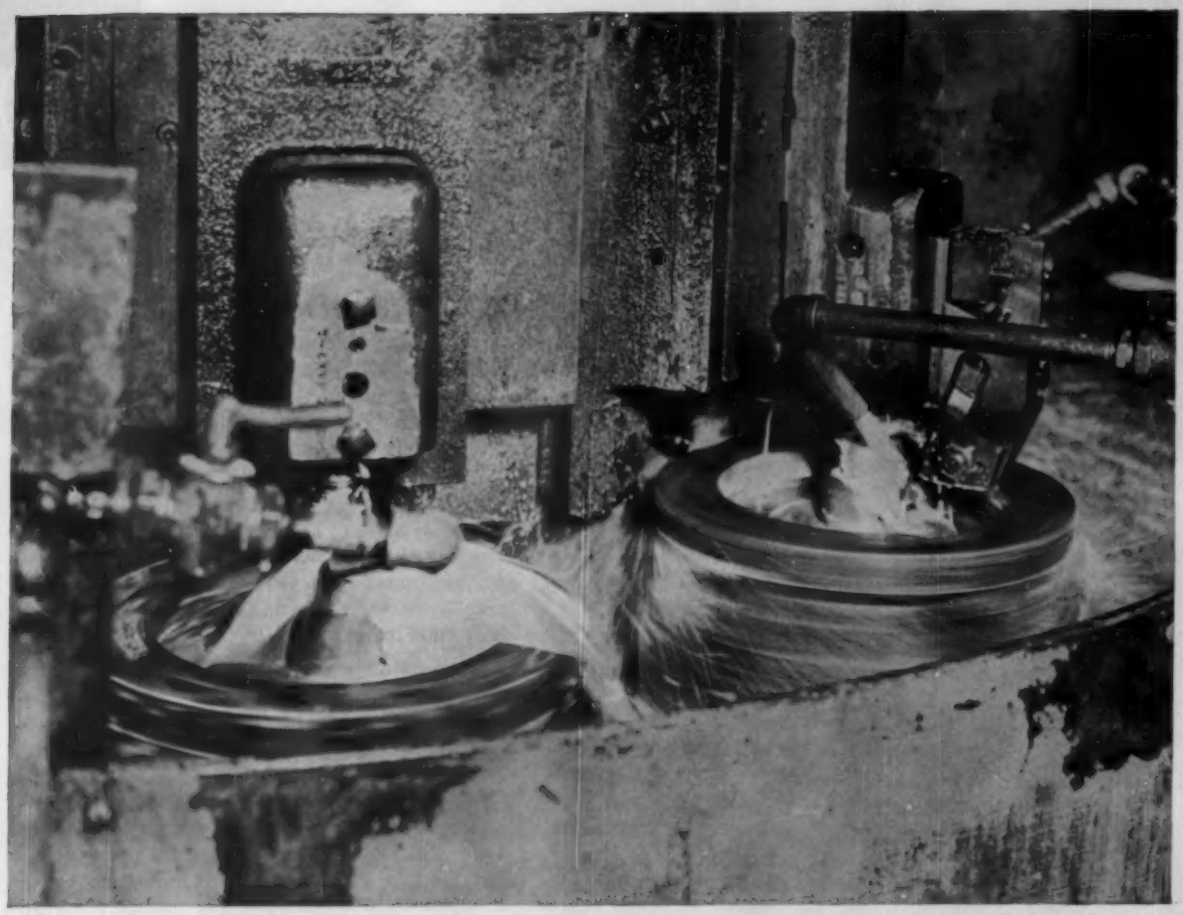
Latest estimates of machine tool imports this year put the total far above the 1957 dollar level. But sales of foreign machines have slumped badly the past few months.

Second quarter gain sighted ...

It seems likely that net new orders for machine tools will stay at a very low level the next few months. In both September and October the monthly total was around $28 million. The November figure probably will not be any better. No sizable pickup in demand is anticipated by most builders until the second quarter of '58.



October marked a leveling off in the decline of new orders for machine tools. On the National Machine Tool Builders' Association index, new orders dropped less than $1 million from September's $28.8 million to $27.85 million in October. Shipments in the same period dropped from $64.7 million to $60.9 million, as did backlogs from 3.7 to 3.4 months



The Kelsey-Hayes Co., Vernon, Calif., has used *Texaco Soluble Oil* emulsions in these Bullard Vertical Lathes for more than four years. They report that Texaco emulsions have demonstrated greater rust protection than previously used products, and have eliminated unpleasant "Monday morning odor."

Even at high dilutions *Texaco Soluble Oils* protect parts from rust

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What's ahead ... in Metalworking

NEWS REPORT

High level to hold to year-end...

Factory operations in the metalworking industries are being sustained at a remarkably high level right up to the final month of the year.

This is not to say that production has been unaffected by the obvious drop in net new orders. It has. But the slide-off has been so gradual that today production is down only 10 points from the year's high on the American Machinist index.

Virtually every major segment of Metalworking is feeling the effects of the decline in sales. Output is off a little in both industrial and electrical machinery. Automobile manufacture, on the other hand, is showing improvement over a year ago and is up substantially from early fall.

Even after allowance is made for all the stretchouts and cancellations, the aircraft and missiles industry is doing better than it did in 1956. But the decrease the past 60 days has been sharp.

Steel, in keeping with the gradual easing of production of metal goods, is plentiful and will remain so through the end of the year.

Steel stocks still large...

Heavy structurals, which were in short supply the past summer, are included. Many mills recently have been accumulating inventories of semi-finished items to shorten delivery time of finished steel to customers. But such inventories now are about as high as they can go.

Stocks of steels in users' hands, for that matter, have been larger than mills estimated. The result is that a pickup in steel operations in the near future is improbable.

Farm implement and tractor sales have provided one of the bright spots in Metalworking. Tractor demand is running ahead of '56.

Incoming orders for freight cars are nowhere near keeping pace with production. Assembly of cars is so high and orders so low that the railroad equipment industry will not have much to do after the first quarter unless business picks up a lot.

Foundries doing better...

Gray iron foundries are noticing a slight improvement in a market that has been almost flat for several months. Operating rate is not much better than 60%. The road-building program is the only area in which increased strength may be evident early next year. Production index for all castings is currently at 104, compared with 122 a year ago.

Things are looking up a bit in the commercial stamping field. The volume of new orders has gained a little recently, but continues considerably below the rate in the fall of 1956.

Stampers are expecting some business in the instrumentation field. They are counting on some new uses being found for stampings.

Tool and die contract shops, reflecting the amount of retooling being done around the country, say that their production lately has been down rather sharply. Shops are running on 40-hr schedules or less. Spotty conditions prevail, with activities in the Los Angeles area having picked up despite aircraft cutbacks.

170

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV. Estimated	OCT. Preliminary	SEPT. Revised	OCT. Year Ago
Total Index	**170**	**170**	**174**	**177**
Machinery	146	151	156	
Electrical Machinery	195	207	218	
Autos	114	94	113	
Other Transportation	362	399	355	
Other Metalworking	142	146	150	

NEWS REPORT

What's ahead: . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	NOV. Estimated	OCT. Preliminary	SEPT. Revised	OCT. Year Ago
Total Index	**154.7**	**154.5**	**153.9**	**149.1**
Metalworking Machinery		182.3	180.4	172.4
Other Machinery exc. Electrical		164.0	163.6	157.3
Electrical Machinery		156.9	157.0	149.1
Fabricated Metal Products		144.5	144.5	141.4

Business edges toward lower level . . .

The normal fall upsurge in business and industry has failed to materialize.

Perhaps the employment situation provides as good a clue as any to what's going on. The nation's total number of people at work showed no change in October. It normally rises in the fall.

Latest federal figures reveal that the manufacturing industries are the weak spot. In October, factory payrolls and employment declined.

The heavy-goods industries especially are feeling the effects of constantly shrinking backlogs. But some consumer industries also have not done so well.

Surveys of employment trends by union officials are less optimistic than those by employers. Industrial payrolls, for instance, are expected to increase slightly, one survey of manufacturers concludes. Auto makers are giving the best support of all industries to employment at this stage.

Some increased employment is resulting from new car production.

The service trades, with the Christmas buying season at hand, have recently been going through their usual hiring rush.

Federal Reserve index of industrial production provides a logical reason why employment has failed to rise this fall. In October the index was at 142 (1947-1949=100). That is two points below September and four below October 1956.

Personal income in the nation was off a little in October from the September rate which in turn was less than the August volume.

Despite the sag in employment and personal income, business is not expected to drop drastically in volume.

Metalworking prices continue to edge upward (see chart) though new orders are off. The rise is very slow but steady.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	140.5	140.2	149.5
Steel ingot operation (thousands of tons)	1,965	1,990	2,463
Electric power output (million Kilowatt hours)	11,953	11,914	11,589
Production of automobiles and trucks	175,996	167,880	167,410
Engineering construction awards (Eng. News-Record—millions)	$ 332.2	$ 373.0	$ 357.6

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	142	144	146
Index of durable manufactures production (1947-1949=100)*	155	159	163
Durable goods manufacturers' sales, millions*	$14,114	$14,297	$13,449
Machinery manufacturers' sales, millions*	$ 4,220	$ 4,281	$ 4,058
Durable goods manufacturers' new orders, millions	$12,603	$13,160	$13,042
Machinery manufacturers' new orders, millions	$ 3,812	$ 4,124	$ 4,104

* Seasonally adjusted

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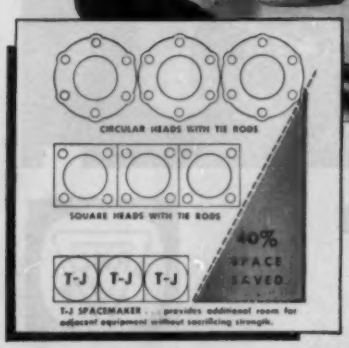
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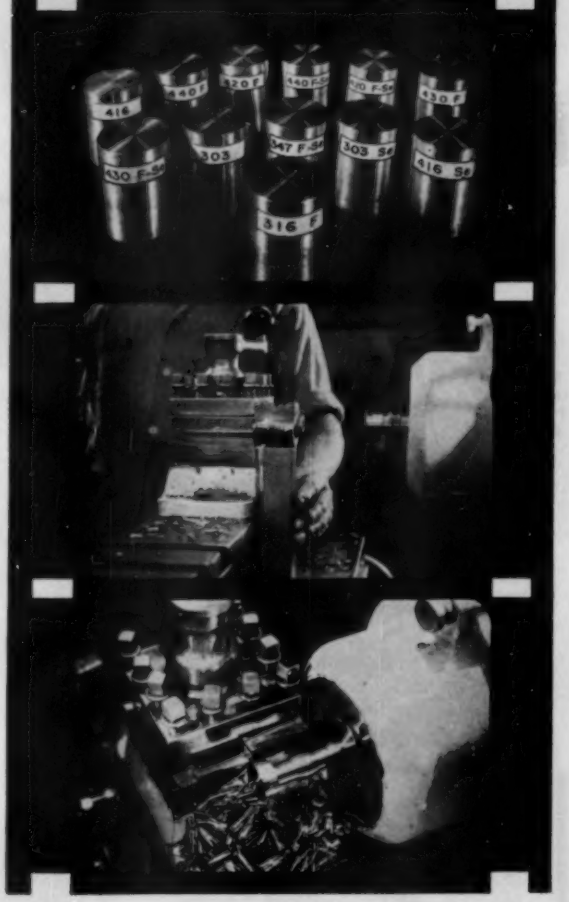

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MAGAZINE OF
METALWORKING PRODUCTION • ESTABLISHED 1877

What Sputnik Has Done For Us

Things haven't been the same since Sputnik. Apparently a lot of people in government and in scientific circles knew last summer that Russia intended to launch its first satellite this fall. But certainly Washington did not foresee the devastating uproar that Sputnik I caused when it rushed upward into outer space. Sputnik II intensified the uproar.

The Russian achievement . . .

has given the American people at least a temporary inferiority complex in scientific matters. We are mortified to find ourselves relegated to second place. We are used to being the biggest and the best in everything. And a nation of peasants, with an industry dating back less than two generations, has shown us up.

Sputnik also scared the daylights out of us. With its successful launching, the Russians proved that they have the capability of firing huge missiles. And though the range may be short of our country now, who knows how long it will be until Moscow can lob an ICBM into Manhattan or Detroit or Pittsburgh or Washington? The thought is enough to make one reach for a tranquilizer.

Hardly had the news . . .

about Sputnik been spread in headlines across our newspapers until Americans began saying to themselves, "Where has our government been all this time? Where are our scientists? Haven't they been given the encouragement and the facilities with which to do a job? How come that we were not the first instead of the Russians?"

And then questions began tumbling over each other, all of them wanting answers. What has happened to our defense program? Have we sacrificed our safety to save a few billions? What part has inter-service rivalry played in our slowness in getting started in missiles? Have budget considerations stifled our research and development programs?

Inevitably the national humiliation over Russia's having dramatically gone ahead of us has led to widespread discussion as to whether we are devoting enough of our educational efforts to science and technology. Advice on what to do has been flowing into Washington in an unending stream.

Perhaps Sputnik I and Sputnik II are the best things that could have happened to us. They have aroused the nation as nothing else has since Pearl Harbor. They have precipitated an agonizing reappraisal of exactly where we are and where we want to be.

We know for sure . . .

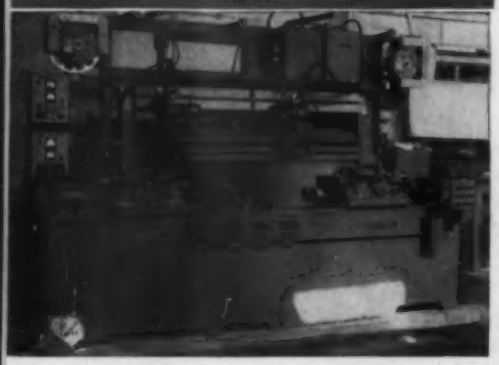
that we want to reassert our leadership in science and technology, that we want to give more emphasis to the sciences and to training for the sciences, that for the sake of our skins we want the world's best ICBM just as soon as possible (though we would not use it unless attacked), that we want a long-term defense research and development program that will not be subject to the whims of the budget-makers, that we want our scientists to have the best possible facilities, ample resources and the nation's enthusiastic backing.

From such a general base, we could go forward to new achievements, realizing that the Sputniks rocked us off dead-center where we otherwise might have stayed until it was too late.

Burnham Finney EDITOR

Accurate heavy cuts by this Cincinnati Rigid Shaper

. . . at NATIONAL ELECTRIC WELDING MACHINES CO.
Bay City, Michigan



The steel slide being machined will be used on a National Automatic MIG arc welder, such as shown above.

Economical production of this steel slide for an automatic arc welder requires heavy cutting with maintained accuracy. The machine chosen for this job is a 16" Cincinnati Heavy Duty Rigid Shaper. Some of the features which make this performance possible are:

- Extreme rigidity due to heavily ribbed column.
- Exclusive Cincinnati 50 PSI pressure lubrication.
- Maximum accuracy due to extended ram bearing and slot-free ram.
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1—Surface structure . . . after primary spark-hardening treatment shows a smooth surface at the interface between the hard-alloy layer and the base metal. Bond is not very strong and hardened layer, only 0.004 in. thick, will chip or peel under impact. Secondary arc treatment provides strength

2—Secondary arc treatment . . . produces a surface structure consisting of a white unabraded surface layer about 0.004 in. thick having a superficial hardness (probably a scratch test) on the Russian scale of "1400 H_v" and, beneath it, a second dense layer 0.060—0.080 in. thick with hardness varying with depth from "1000 to 500 H_v." There is no comparable American standard for superficial hardness, but the Russians hardness scale appears similar to Vickers. For comparison, the range of "1400 to 500 H_v" seems similar to the Rockwell Superficial (30-N) range of 92 to 65

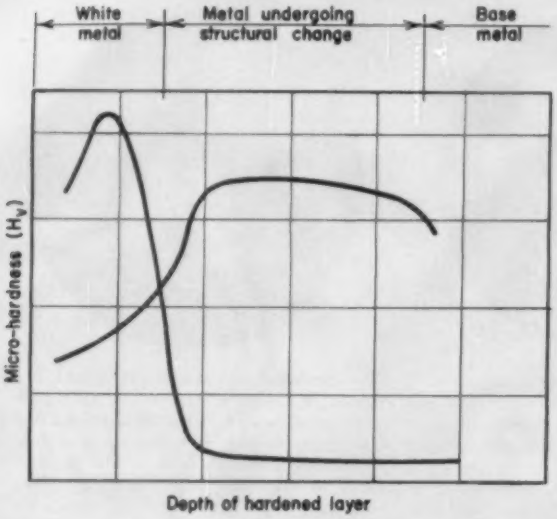
SPARK plus ARC hardens steel in Russia

As reported by I I KICHKIN in VESTNIK MASHINOSTROENIYA

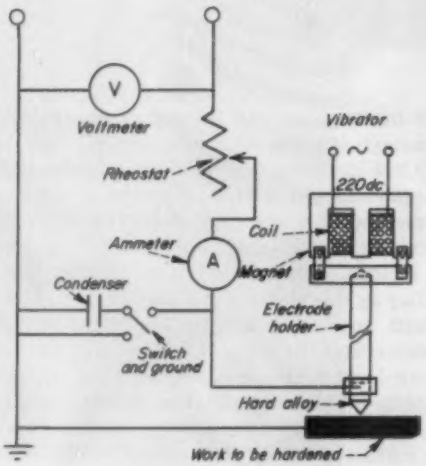
Thermo-electric spark hardening of machine parts is being followed with considerable interest in Russian manufacturing research and development. An outstanding advantage of this method is its simplicity of application. Hardening can be done at the machine tool—lathe, shaper, planer, etc—with the electrode replacing a cutting tool. Because the spark-hardened surface is only 0.004 in. deep, a composite method combining spark and arc is used to provide up to 0.080 in. depth of hardness. Technique is used for hard facing

Surface hardening solely by electric sparks has the disadvantage of producing an extremely thin layer, about 0.004 in. thick, which is easily deformed. In most applications it is more practical to use a combined method of surface hardening which consists of depositing a thin hard-alloy layer by the electric-spark method (electric-spark hardening using a hard alloy as one electrode) followed by heat treatment with an electric arc, for which the same current source and the same vibrator are used as for the spark-hardening operation, with the capacitance disconnected from the oscillation circuit. As a result of the first operation a hard-alloy layer is deposited on the surface (Fig. 1). The second structure of the metal is shown in Fig. 2. Two distinct zones are seen in the microstructure of the surface-hardened layer in each of the specimens used in the experiments; the hardness showed a continuous change from the top to the intermediate layer, without any sharp hardness changes. As a result of the formation of a second layer, the thickness of the surface-hardened layer increases, hence also the wear resistance of parts so treated.

The graph (Fig. 3) shows how micro-hardness varies with depth. Detailed structural analysis shows that, in addition to melting, the intermediate layer is also subjected to partial hardening, because the



3—Variation with depth . . .
of the micro-hardness obtained with spark hardening alone (curve 1) and with the composite spark plus arc heat treatment (curve 2) of specimens of "Steel 3," similar to SAE 1017



4—Equipment for electric hardening . . .
is designed to produce impulse spark discharges during the first stage of operation; then an arc during the second stage. This simple circuit can be used. It consists of an ordinary discharge circuit fed by 220 volts dc. Work to be hardened is connected to the negative pole while the hard-alloy electrode, the anode, is connected to the positive pole. Condensers are connected in parallel to the spark gap, both connected to the positive pole through a variable resistance in series to limit the short-circuit current; a switch is provided to disconnect condensers from circuit. Condenser capacity is, constantly, at least 300 micro-farads. Voltage and current are measured during operation. *WARNING:* Use of this much power is dangerous and should be attempted only under professional supervision

mass of the melted layer is relatively small compared to the mass of the hardened component. With depth, a gradual transition from martensite to acicular troostite is observed in the hardened structures. The surface layer consists of a film of carbides of iron plus the metal from the hard-alloy electrode used in the spark hardening, such as carbides of titanium or tungsten. Thus, as a result of the combined treatment, hard carbide grains form on the surface embedded in a less hard but stronger base.

The resistance to wear of these layers (in tools and components), when subjected to abrasive wear, increases as the strength and the hardness of the base metal are increased in comparison with the hardness and strength of the worked material. Increasing the hardness of the deposited carbides also increases wear resistance. Micro-hardness for some materials and the structural parts of deposits is:

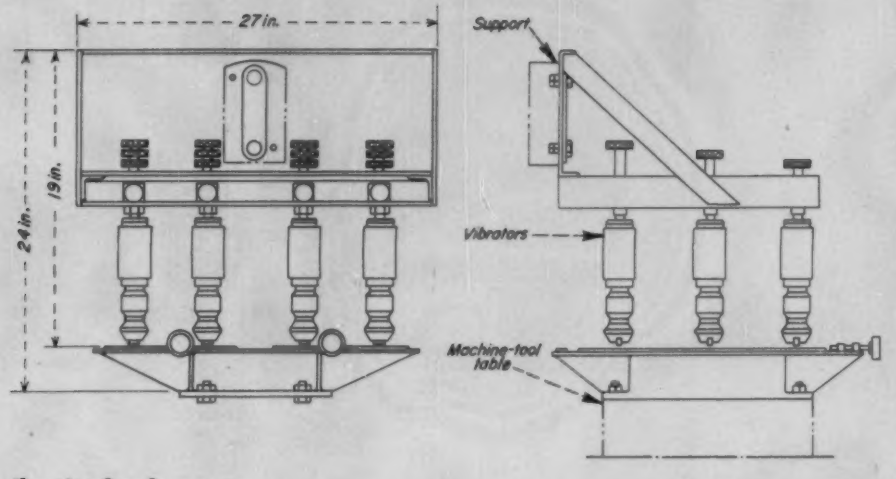
Ferrite	140 - 150
Pearlite	240 - 270
Granite	300 - 800
Quartz	780 - 800
Iron carbide (cementite)	800
Facing, manganese alloyed (austenite base)	330 - 600
Facing, manganese and chromium alloyed (austenite base)	500 - 680
Complex carbides	1200 - 1600

Values given in this table indicate that components hardened by this method are suitable for working most abrasive materials. For particularly difficult conditions of operation, as when the specific pressure of the abrasive mass is large, it is advisable to heat treat or case harden the part to a depth that assures sufficient rigidity of the carbide film and the intermediate layer.

Equipment for composite electric hardening must be designed to produce impulse spark discharges during the first stage of the operation and an arc during the second stage of the operation. A simple circuit satisfying such requirements is shown (Fig. 4). If the capacitance is too small, the intensity of transfer of hard-alloy particles to the component surface will not be sufficiently large. The intensity of the discharge current during the first stage of the operation and of the arc current during the second stage of the operation is regulated by the variable resistance (rheostat).

The anode, hard alloy, is made to move reciprocally by the vibrator at a frequency of 120 cycles per sec (for 60 cps current supply) which causes the discharge circuit to make and break with the same frequency. The vibrator is simple; it consists of an electro-magnetic system fed directly from the ac supply network. The supply voltage either can be the same as that of the supply network or, for safety, can be stepped down to a low voltage of, for instance, 12 to 24 v. The vibrator head holds the electrode and is connected to the positive pole. The metallic table which holds the component to be hardened is connected to the negative pole.

Hardening is carried out in two operations of the electrode: During the first step, the surface is spark



5—Twelve vibrating heads . . .

are mounted on a frame attached to the toolholder on a planer. Heads are arranged in three rows, with four heads per row.

Frame is a carbon-steel weldment. This setup enables simultaneous treatment of 20 die plates used in clay-brickmaking presses

treated; during the second step the surface is heat-treated by the arc. After spark treatment the condenser battery is disconnected, thus changing over the equipment for arc discharge. To disconnect the condenser a single-pole double-throw switch is used with one side connected to "ground," and the other side connected to the "+". This permits use of the switch to remove the residual charge of the capacitance. *The circuit must be disconnected from the supply source before the capacitance is disconnected.*

Depth of heating of the metal by the arc, hence the degree of diffusion of the elements from the hard alloy on the surface into the basic mass, depends on the current intensity of the arc discharge.

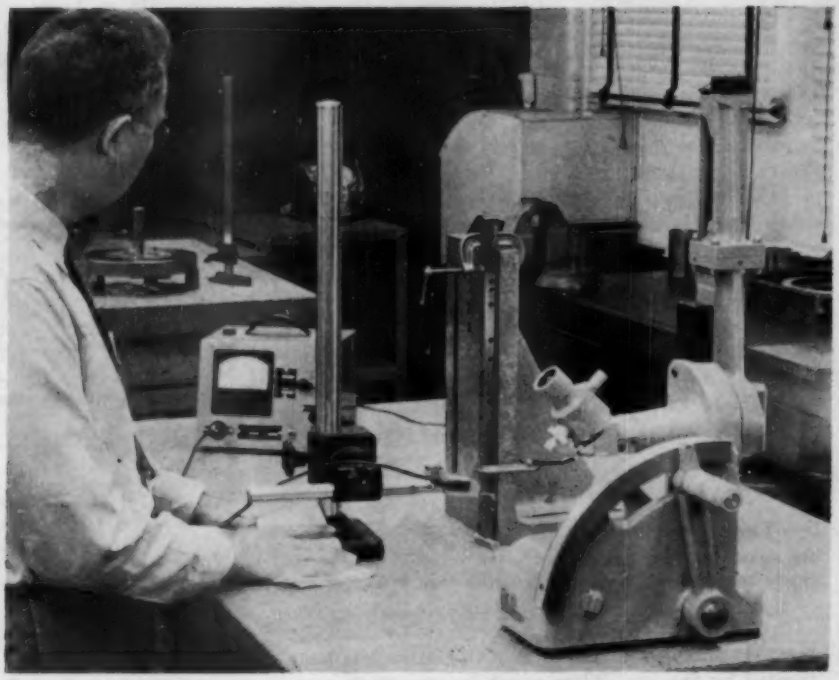
Just as with conventional hard facing, the composite spark-arc treatment decreases surface quality, particularly if current of high intensities are used. With an arc current of 30 amp, surface nonuniformities may reach 0.080 in. Therefore, in choosing the magnitude of the resistance, it is necessary to take into consideration not only the desired degree of hardening but also the permissible surface roughness. Current intensity values recommended for use in treating various components, at a voltage of 220 v using capacitances of 300 to 500 microfarads, are.

	Current intensity, amp	
Component	*Spark discharge*	*Arc discharge*
Blades of mud pumps, scarifiers, worm concrete mixture feeders	10-15	30-50
Replaceable plates of brick presses, press molds for pressing abrasive disks and other components for which a tolerance of the linear dimensions 0.004 to 0.010 in. is permissible	8-10	10-12
Cams for various drives, pushrods and similar components	5	8
Blades for cutting slates, disk saws for cutting asbestos, marble and other materials	10	10-15

During the treatment the vibrator can be moved along the component by hand or mechanically. It is also possible to mechanize movement of the work relative to a stationary vibrator. In both methods, mechanized operation is more efficient and cheaper because it enables treatment of large pieces simultaneously with several vibrators or simultaneous treatment of several pieces of the same type with synchronously operating vibrators.

To mechanize the process for work having flat surfaces, a planer or a surface grinder can be used to automatically move the component relative to the vibrator. For cylindrical work, a lathe can be used with the piece held between centers and the vibrator held by the toolholder. The work will rotate while the vibrator moves automatically in a longitudinal direction. Current is fed to the work by standard brush arrangements.

Various components treated by this method and used under abrasive conditions show considerably improved wear resistance compared to equal nonhardened components. Treated plates for brick presses show resistance to wear increased by five to eight times when ordinary case-hardened plates were used. Treatment of the blades of large pumps, used to pump soil slurry, increased their wear resistance by 150%. Results show that it is possible to substitute special steels for cutting marble and asbestos with a standard grade of steel, "Steel 3," provided the carbon steel is treated by this process. Simplicity of operation and its low cost suggest this technique for a great variety of parts subject to abrasive wear.



De Vlieg setup bars are checked to 0.0001 in. with an electronic height gage

Quality Control begins with

Warner & Swasey had several objectives in working out a gaging policy. Three of them are: (1) Operator should have as good a gage as the inspector; (2) he should gage the piece in the machine if possible; and (3) the gage should be of a type that will tell him "where he is going." Good gages, jigs and fixtures are slashing rework and assembly delays

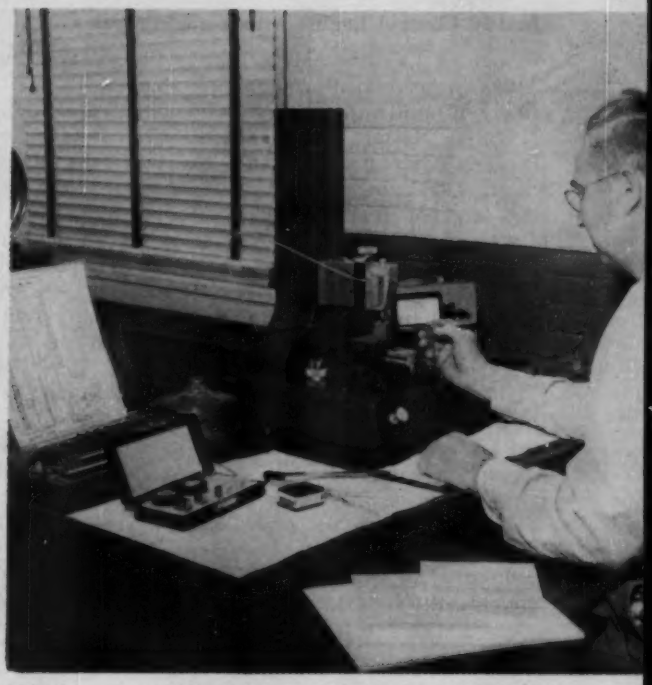
Quality control can cut costs for a machine-tool builder just as well as for a mass-production manufacturer. In fact, the low-production nature, even jobbing characteristics, of a machine-tool builder's business make quality control and gaging policy the primary tools in an effective cost-reduction program. Machinists can waste a great deal of time checking large work by old-fashioned methods. Too often a piece will be removed from a machine merely for the purpose of measurement, when it could have been checked without disturbing the setup, if the correct type of gaging equipment had been used. Furthermore, machine-tool components are costly pieces, as a rule. So they should be made right, every step of the way.

The Warner & Swasey Co has developed a gaging policy and a quality-control program that are getting results. This is not to say that the Cleveland company has not paid considerable attention over the years to good gaging practice. Far from it. For more than 30 years, a Gage Room has been maintained for the purpose of of checking to any degree of accuracy required, up to and including that for telescopes, which are still made in the plant. This Gage Room acted solely under the direction of the Manufacturing Department to check gages, but today it functions under the direction of the Quality Control Dept. Now every gage in the plant has a history card, and at intervals the gage is brought to the Gage Room and checked by specially trained personnel against masters. A set of masters is maintained for every gage in the shop. Over 5000 plug-gage masters are located here. Repairs are made as needed. Gage inspectors have been sent to gage-producing companies for training in gage repair and lapping of plugs, for example. All new gages or inspection machines wanted by the shop are evaluated here.

TYPICAL EQUIPMENT

The Gage Room is equipped to make measurements to one millionth of an inch. Almost every gage manufacturer in the United States and many in Europe are represented by their equipment. Too much space would be needed to mention all of these manufac-

Gage bar is checked for length on a Pratt & Whitney measuring machine with electronic head



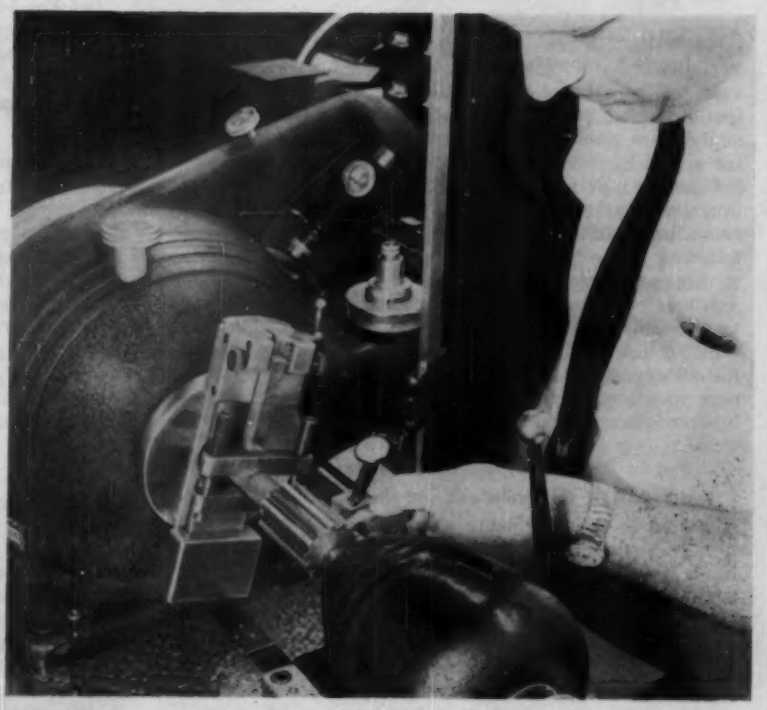
Working gage blocks are checked on an Electrolimit height gage capable of reading to millionths

a gaging policy

RUPERT LE GRAND, senior associate editor

turers, but several typical types of equipment are:

1. A Pratt & Whitney Electrolimit gage to check internal and external diameters to one millionth of an inch.
2. Two Pratt & Whitney measuring machines, one with an electronic head.
3. A Vinco dividing head for checking angles optically.
4. Collimators to check flatness of surface plates to 0.0002 in. (on a 48 x 36-in. plate or any 3-ft square—along diagonals and on a 5-in. grid).
5. A Bausch & Lomb contour projector to compare angular and surface profiles, and make micrometer measurements of deviations from the master profile.
6. A Zeiss comparator for checking pitch diameter of master thread gages.
7. Webber optical height gages.
8. Optical flats.
9. Cleveland Instrument Co's electronic indicator, used with



Spacing of gear teeth is checked with a Vinco optical dividing head

Quality Control begins with a gaging poicy . . .

Webber or Cadillac height gages to make measurements to approximately 40 millionths.

10. Set Master gages (Boice Gage Co) for measurements to within 0.0001 in., when transfer rings are not available. The Set Master is set with gage blocks to the desired dimension, the Boice indicator gage is set to the Set Master and the dial gage to zero.

The Gage Room has a number of responsibilities:

1. To record all gages used in the shop. Each gage has a number and a history card. At least twice a year, and more often for high-use items, gage inspectors go out to tool cribs, pick up gages, and inspect and repair them. Data accumulated on history cards may influence the frequency of inspection, preventing overlong use of gages.

2. To maintain a gage-catalog file. Data on every known make and type of gage, American and foreign, are kept in this file for reference.

3. To evaluate gaging equipment desired by Tool Design for a specific job. After agreement is reached, Tool Design designs around the selected gage equipment. Here the Gage Room functions as part of the Methods Dept.

4. To work with vendors and evaluate gages for acceptability within established gaging policy.

5. To measure certain precision parts—especially spindles. The Gage Room is held at 68 F constantly. Therefore a spindle is brought in from the shop, placed in a trough filled with soda water, and soon cooled to reference temperature.

Gage inspectors grow in ability as a result of these activities. Their contacts with the shop, with Tool Design, with the Methods Dept, and with outside vendors rapidly build up and extend expert knowledge of gaging methods, problems, relative accuracy, and what to watch for. Instead of being a gage inspector, as it were, a man working in the Gage Room soon becomes a practical specialist in the art. His job becomes more important and he experiences stimuli that did not previously exist.

Jig and Fixture Inspection functions as an adjunct of the Gage Room. Surface plates, height gages and gage blocks are provided for

W & S Gaging Policy for

(This material is part of the company's written policy on gaging and is incorporated in the

The following types of gages are available for measuring internal diameters:

I. Plug gages (standard and odd sizes)

II. Dial bore gages (used with a Set Master or transfer ring)

III. Air plug gages

IV. Intri-Mics

V. Inside micrometers

Each of these types has its place in the W & S system of gaging, and every situation should be carefully analyzed so that the proper type of gage is used to fit the application. Also, it is important that shop personnel use the type of gaging called for and not substitute other methods. Should the type of gage called for prove inadequate, then normal procedures should be followed to see that all records are corrected and the proper type is specified.

A brief resume on each of these gages is given here to provide a "rule of thumb" guide in the use of each type. It is impractical to pinpoint every application for each type, but by following the thoughts expressed here and considering the economics and practicality involved, in nearly all cases the right gage can be provided.

I. PLUG GAGES (standard and odd sizes)

A. When to consider using plug gages:

1. For hole sizes ranging from 0 to and including 3 in. in dia. Go and no go member on same handle.

2. For any diameter when drawing calls for "Fit to Gage." (a) Any diameter—provide go member only.

3. On parts with average or high production.

4. Not to be considered when it is desirable to know the exact hole size when approaching or being within allowable tolerance, such as in honing or grinding operations.

B. Classes of gages and when to use:

1. Hole tolerance 0.0005 or less:
   (a) For hole dia over 0.500-in.—use Class XX
   (b) For hole dia 0.500 in. or less—use Class X
2. Hole tolerance 0.0005 to 0.002 in.:
   (a) For hole dia 2.500 in. or less—use Class X
   (b) For hole dia over 2.500 in.—use Class XX
3. Hole tolerance over 0.002 in:
   (a) For hole dia 3.500 in. or less—use Class Y

II. DIAL BORE GAGES (used with a Set Master or transfer ring)

A. When to use:

1. In hole size range from 0.250 to and including 24 in. dia.

2. When necessary to measure actual hole size to within 0.0001 accuracy. Gage is set to the minimum hole dia size with the Set Master.

3. To transfer a size from a transfer ring to a part. (See Procedure on Transfer Rings.)

4. For gaging average production parts on sizes over 3½-in. dia when interested only in knowing if hole size is within limits. (In other words, picking up where plug gages leave off.)

III. AIR PLUG GAGES

A. When to use:

1. For hole size range 0.125 to and including 8-in. dia.

2. On average production parts—to determine exact size of hole within the allowable tolerance, such as grinding and honing.

3. For gaging long holes—to be able to probe entire length of hole in order to know size as well as geometry of the hole.

4. Where dirt, etc, is a problem. Air blast will clean area when gaging.

acceptance inspection of new jigs and fixtures, for inspection after repairs, and for inspection prior to return to tool cribs.

All new jigs and fixtures are delivered to the inspection area upon receipt. The inspectors check the prints and the tooling to see if dimensions and features will provide proper location of the workpiece. If not, the jig or fixture is sent either to the toolroom or the vendor for rework. Quite often a designer will overlook a necessary feature in a jig or fixture or not provide practical means for work location. Such instances are reduced by closer liaison between tool design and the injection department during the jig or fixture planning stage.

A jig or fixture that is checked out OK is given a yellow tag and sent to the appropriate crib. When it is called out for use, the operator sees the yellow tag and makes the first piece under the eyes of his foreman and a tool technician. If this piece is found within tolerance, the yellow tag is removed, the fixture is approved, and the catalog record is so marked.

If part inspection later on finds a piece out of tolerance, the tool technician is called in, and he writes up the faults with a priority order for repair and recheck. After passing a satisfactory recheck, the fixture again gets a yellow tag.

In the shop, quality control is advanced by the use of Paredo curve analysis of scrap and rework. Graphs show the scrap and rework loss by part number in proportion to the total loss in a particular department. The total scrap or rework charged to the department is shown in the right-hand column. The part number and operation causing the greatest loss is then subtracted. Moving in bar chart form to the left, each succeeding part number's loss is subtracted.

The purpose of these charts is to highlight the few parts that cause the largest percentage of loss. One chart is made for each 20 parts. Some Paredo charts may show a rather even and relatively small amount of scrap or rework expense for all parts—others indicate one or more parts that are problems.

By instituting a gaging policy in 1953 and developing a quality-

Internal Diameters

firm's standards book. Additions and changes are made as experience is gained)

B. Accuracy obtainable:

1. Can be used for gaging to 0.00005-in. accuracy.

IV. INTRI-MICS (Brown & Sharpe)

A. When to use:

1. For hole size range 0.275 to and including 4-in. dia.
2. On low-production work only, repair work, etc.

B. Characteristics:

1. Actual size of hole can be read off the barrel as close as the graduations (0.0002 in.).
2. Gage is accurate to within 0.0002, but it must be checked before each application to maintain this accuracy.
3. Cannot check shallow holes and only indicates an out-of-roundness condition.

V. INSIDE MICROMETERS

A. Use:

1. Inside micrometers will always be available for use:
   (a) For hole sizes larger than 2½-in. dia.
   (b) For low-production parts.

B. Characteristics:

1. Can measure a hole and determine actual size to within 0.001 to 0.002-in. accuracy.

Installation of Gaging Policy:

The installation of the policy will be gradual and will be covered in two distinct types of work:

1. The new job—as we route and tool the part.
2. The current job—as we work on parts in our daily service type of work.

The shop, as they run the parts and would prefer to change over immediately due to problems or the lack of gages, will notify the Standards Department to change the setup cards to suit this policy.

The plug gages, inside micrometers and air gages will be used as they are at the present time, but the Intri-Mics and the dial bore gages will be used as follows:

1. The Intri-Mics will be located and issued from the inspection area of Main Tool Supply. The inspector in Main Tool Supply will be responsible for issuing and checking the gage. Return of the gage after each application will be the responsibility of the using department.

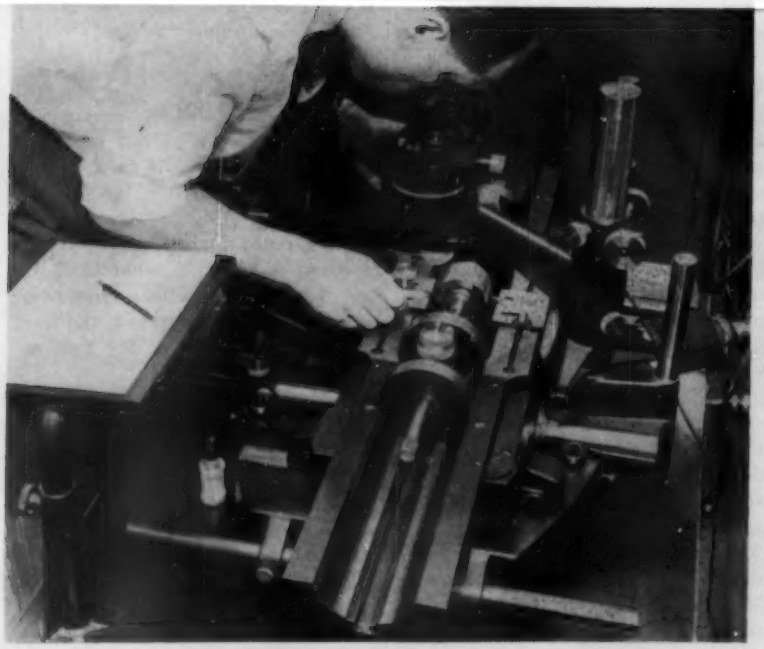
2. The dial bore gage will be used with the Set Master (Boice Gage Co) in most cases. All bore gages and Set Masters will be located in the inspection area of the Main Tool Supply. The setup card will call for the correct dial bore gage and Set Master, set the correct diameter. It will be the responsibility of the Inspector in Main Tool Supply to set the Set Master, and to mark the size it is set to, on a piece of tape and attach it to the Set Master. The dial bore gage and Set Master, in their respective boxes, will then be delivered to the job by the Tool Supply Clerk.

It will be the responsibility of the operator to check the size marked on the Set Master to the current blueprint for the job. If they agree, the gage will be used on the production run. Return of the gage and Set Master, in their respective boxes after each application, will be the responsibility of the using department. The Inspection Department should also keep a running check on the usage of the individual sizes of both the Intri-Mics and the dial bore gages and Set Masters and furnish the Shop Tool Design Department with this information, so that an adequate quantity of gages can be kept on hand.

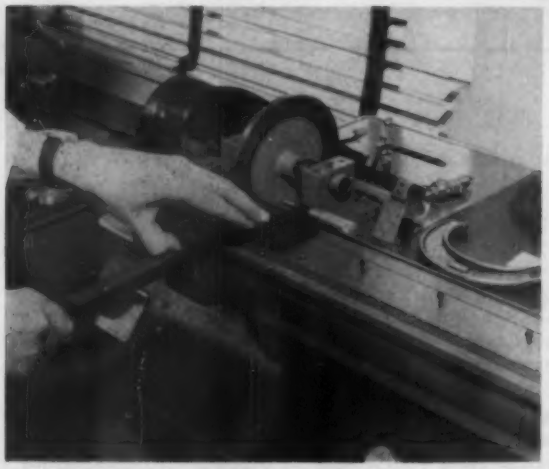
Maintenance of Gages

It will be the responsibility of the Gage Room to set up the necessary procedures for maintaining good, accurate gages in sufficient quantities, for use in the shop.

Quality Control begins with a gaging policy . . .



Dimensions of a master thread gage are checked with Zeiss comparator, or universal measuring machine

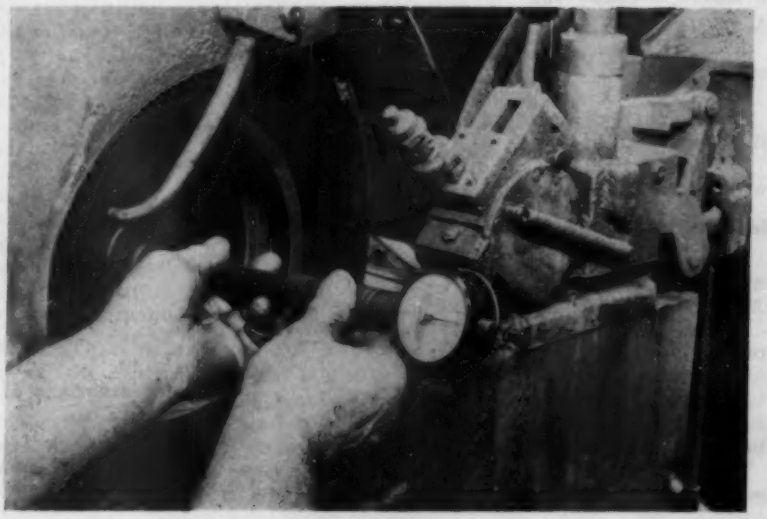


Tumico lapping machine reconditions micrometer anvils and bar gages. To lap micrometer anvils: (1) lap the movable anvil, (2) assemble, (3) lap fixed anvil square with movable anvil

When a plug gage grows, or is replaced with one that needs minor sizing, it is lapped on a Spitfire cylindrical lapping machine to a finish of 5 to 10 Rms

control program, Warner & Swasey has been able to save a considerable amount of money, to build skills where they count, and to cope with the changing skills in the labor market.

Management does not want the programs to grow to a certain point and become static. There is little chance of that, because something new can be learned every day in the gaging field.



Boice Set Master gages are used in grinding department

WANTED: *Improved anchoring method*

H K LEE, senior design engineer, GENERAL PRODUCTS DIVISION, FORD MOTOR CO, DETROIT

Common sense tells us that all machine tools should be properly fastened to their foundations, and that the anchoring methods should be given due consideration as an engineering problem. However, machine tool builders generally treat it as a simple, inconsequential matter, leaving it entirely to the buyers and field installation men. For this reason, thousands of machines are now on the ailment list—excessive vibration and abnormal operating costs—or even in scrap for causes that can be traced directly to improper anchoring. It is time to check into such types of failure.

One recent example of an anchoring problem was the installation of a giant automatic transfer machine in a very modern plant. There were troubles and delays in the installation, then more troubles in setting up and getting into operation. Finally, a more solid foundation had to be constructed to make absolutely sure the machine was properly and positively anchored before it could be put into smooth running order. This is an expensive experience and clearly illustrates the importance of good anchoring.

Another time in the installation of four giant eight-station center-column machines, a thorough search was made for an adjustable anchor bolt which could be set flush with the floor surface. The only thing available was an expansion-type bolt which could not possibly meet structural requirements. Therefore, solid blocks of steel 6 x 6 x 8 in. were welded to the top flanges of steel beams and embedded in concrete foundations. The anchor-bolt holes were field drilled and tapped after the machines were in place. The importance of positive anchoring justified the costly method, but doesn't this kind of problem constitute a challenge to the engineering profession?

Present-day anchor bolts for machinery are still rather primitive and crude in design. They are merely steel rods, hooked at one end and threaded at the other. The designer specifies only the size and the length. Theoretically, the design of this particular bolt can be quite sound. But in actual practice, it raises two serious objections.

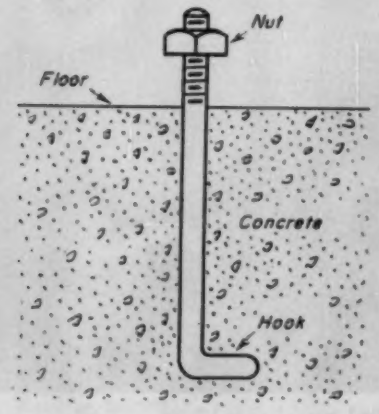
The first one is that the 3- to 6-in. projections above the floor surface present a serious obstacle to moving heavy machines preparatory to their being anchored in place. Material handling men are slowed to a snail's pace for fear of damaging these projections, and yet many bolts do get knocked down or bent over. Once damaged, they are almost beyond repair. Furthermore, the work required to raise heavy machines and center them on the bolts entails extra cost and labor, especially when there is no overhead crane.

Secondly, on field installation it is hard to place a bolt and hold it in a fixed location while pouring concrete. Consequently, after the concrete dries, the solidly embedded anchor bolts frequently are not on the desired location. Then it is too late.

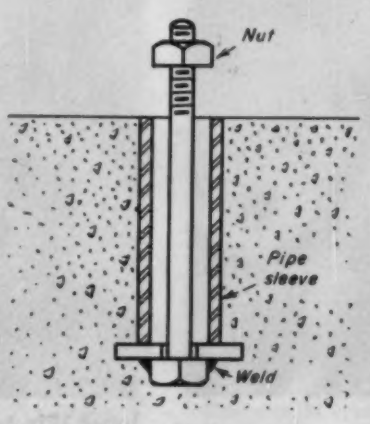
The only improvement in flexibility offered so far by the machine designers is to set the bolt inside a pipe sleeve. This method gives more length and space for movement, but the bolts still have to be bent by hand to fit into the bolt holes provided in the bases of the machines.

As the machine industry is now placing increased emphasis on research and development, it is time for efficiency engineers to create a new and better anchoring method, one that will meet all the following requirements: (1) it must be easy to install on the correct location; (2) it must not project above the floor surface; (3) it must permit the construction of a smooth, durable surface to receive the machine, thus eliminating grouting under the base after a machine is installed; (4) it must provide adequate structural strength, unlike the expansion-type bolts which offer only partial structural value; and (5) it must be flexible enough for easy adjustment in all directions.

The machine industry must lead the way in developing an efficiently engineered anchoring method to meet the above five requirements. It is long overdue. Machine builders must promote it to protect their own interests and to insure the high performance of their machines. It is their natural responsibility and cannot be abdicated to the buyers and installation men.



Traditional anchor bolt . . .
is hard to locate correctly and complicates machine installation

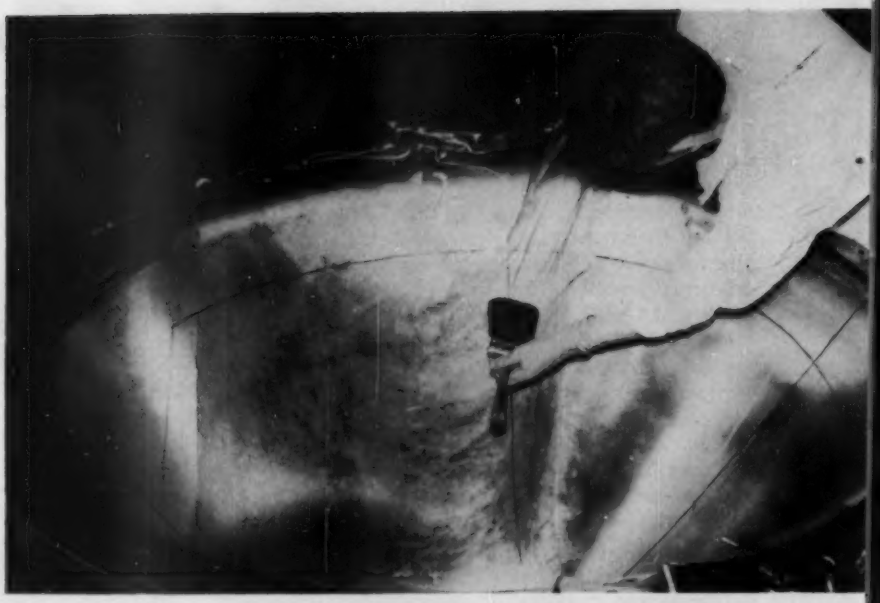


One step forward . . .
this improved method provides some flexibility but retains other disadvantages of the old method

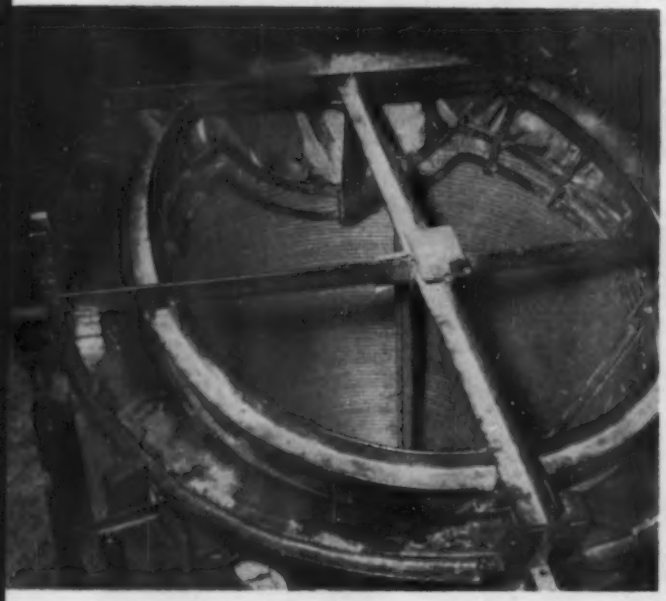
"Lost Wax" builds de-iceable

Formula for a lightweight, tough aircraft housing: Shape a wax form, wrap it in glass cloth and epoxy resin, cure the plastic, then melt out the wax. Douglas uses this patented process to produce radomes that have integral connected flutes through which heated air can be forced to prevent icing in flight. Current production is for military and DC-7 transports, and the method will be applied for the new jet DC-8

GENE MOORING
and CARL R DEMONS,
process engineers,
DOUGLAS AIRCRAFT CO,
SANTA MONICA, CALIF



Radome is laid up . . .
. . . in electroformed nickel mold. First layer is No. 120 glass fabric (0.004 in. thick), and second is No. 181 (0.009 in.); both saturated with a formulation of Epon 828 (Shell Chemical Co) and curing agent CL. Mold has integral coils for 180-F water that will cure the plastic binder. Tooling for radomes is similar to that for honeycomb domes



Second layer of mandrels . . .
. . . is positioned diagonally across first layer for strength. Trim fixture here helps chop mandrel ends to edge shape required in finished radome. Repair work in service is same as positioning original mandrels, cloth, and resin

Inner skin is laid up . . .
. . . on male mold with two layers of glass cloth and resin coating. Mold is aluminum with foam-rubber or solid-aluminum face. Matched molds may be cast aluminum. Positive pressure between molds exerts wiping action

First layer of mandrels . . .
. . . is laid against glass-fabric skin to conform to contours of the radome shape. Mandrels are actually rectangular extrusions of wax wrapped in glass-fiber tape that is impregnated with epoxy resin. Mandrels curve easily, and can be sharply bent without breaking

Mandrel layer is completed . . .
. . . by butt-joining short lengths. Joints are made by stripping tape off the ends, joining the exposed wax, then rewrapping with glass cloth and recoating the cloth with resin. Mandrel size is changed by replacing wax-extruding nozzle, but tapered mandrels cannot be made except by expensive casting

radomes

Mold is mated . . .
. . . in Douglas-built rig made from standard components. Hot water is circulated until epoxy resin has cured (but wax does not melt). Production cost for lost-wax dome is about same as for honeycomb

Radome is removed . . .
. . . from mold and holes are drilled in ends of mandrels, which now resemble flutes because all glass-cloth wrappings have been molded together. Dome is placed in oven and heated to melt out all wax. Finally, edges are trimmed to match manifold

"Lost Wax"
builds
de-iceable radomes . . .

Manifolds are added . . .
. . . by casting wax to shape and covering it with four or five layers of No. 181 glass cloth saturated with a room-temperature-curing epoxy resin. Remaining radome area is masked to keep it clean

Completed manifold . . .
. . . with wax melted out has two entry ports and one exhaust port. Weight is 3 lb/cu ft, opposed to 6-10 lb/cu ft for honeycomb or foamed structure. Strength (which is directional) is slightly less, but bonding is more certain

Last step is to coat radome . . .
. . . with Epon resin-base primer and top-coat formulation (Finch Paint Co, Los Angeles). Process is also applied to stabilizer leading-edge tips that must also be de-iced

Brazing makes metal hose of coiled wire

FREDERICK C SCHAEFER, sales manager,
AMERICAN GAS FURNACE CO, ELIZABETH, NJ
THOMAS ADMERAND, methods engineer,
BENDIX AVIATION CORP, SOUTH MONTROSE, PA

Helically wound flexible tubing, commonly called flexible metal hose, is an important item in modern aircraft, machine tools, and a great many other mechanical devices. Its strength permits it to carry high pressures. Its resistance to corrosion and abrasion are indispensable features in certain applications. And its flexibility provides other major advantages, such as the simplification of assembly and the ability to withstand vibration as well as the expansion and contraction that come with wide temperature changes.

At the Montrose Division of Bendix Aviation Corp, this type of hose is made from nickel iron, which is fed in strip form into a winding machine. Copper wire is fed along with it, and the two are spirally rolled into a continuous tube over 40 ft long. Then the tube is compressed from both ends, reducing its length by nearly 50% and creating what appears to be a flexible spring. In this incomplete form it is called "convolutions" and still must be furnace brazed before becoming a hose. The copper wire, of course, acts as the brazing material.

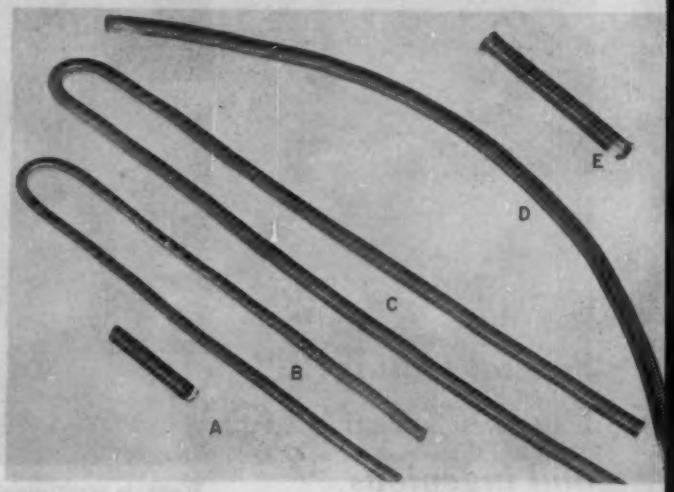
To achieve a clean, bright braze, the convolutions are brazed in a dissociated ammonia atmosphere provided by an AGF Ammonia Dissociator which supplies three parts hydrogen to one part nitrogen. Several bells are employed for the work so that the various phases of the process can be carried on simultaneously.

First of all, the convolutions, in baskets, are loaded into a bell. Then it is purged and filled with hydrogen from the dissociator. When the furnace (an AGF Model 78) has been brought to approximately 2000 F, it is opened to receive the charge. The cover, supported by a vertical column, is elevated hydraulically and swung to one side by hand. Then the bell is lowered into the hot furnace by an overhead hoist.

At the end of the heating period, the bell is removed to cool, and another one can be lowered into the furnace. After it has cooled off sufficiently, it is filled with nitrogen to drive off the hydrogen, and the work is removed.

Next, the spiral tubing goes to the braiding room where three braiding machines completely cover it with braided bronze or nickel wire. This completes the flexible metal hose. All that remains to be done before installing it in an aircraft or other piece of equipment is to cut it to the required lengths and assemble the necessary fittings.

One interesting feature of the Montrose plant is that the brazing operation is performed in "found" space. At one time it was an inside loading dock, but for some time it had not been in operation. With its fireproof walls (brick and concrete block), it made a perfect spot for the furnace, which not only brazes, but also performs a variety of heat treating operations.



Flexible metal hose in various stages . . . of manufacture. "Convolutions," a section of which is shown at *A*, are brazed in two different sizes, *B* and *C*, then covered with braided bronze wire and cut to desired lengths

Bell is lowered into preheated furnace . . . for brazing operation. Baskets at left hold additional "convolutions" to be brazed in next cycle. Ammonia dissociator, left rear, supplies hydrogen and nitrogen as needed for atmosphere control inside bells

Special tooling... Unusual setups... and ingenious ideas for...

Work is positioned at any angle . . .
without unloading and without changing tool setup on 3-spindle BG Keller. Swiveling fixtures for templet and workpieces have index holes to permit accurate alignment through 360°. Result: one setup now completes a job formerly requiring 12 different setups—contour machining wing terminal fittings for B-52's

Production machining with die-making

Machining extremely accurate structural components of Boeing's B-52 on a short-run, job-shop basis requires a high degree of efficiency. The ingenious setups for this work at the Richmond, California, plant of Kaiser Aircraft and Electronics include a radial drill for broaching and assembly, three-spindle Kellers with indexing fixtures, and a number of special, single-purpose machines

GEORGE H DeGROAT, Detroit editor

A variety of steel and aluminum parts ranging from landing-gear bulkheads down to small fittings are made for Boeing B-52 bombers and KC-135 tankers at the Kaiser Aircraft & Electronics Corp, Richmond (California) Machining Division. In addition to complex shapes and close tolerances, low-volume production requirements increase the problems involved in making these parts. To handle the work fast and efficiently, special tools, fixtures, and machines have been developed.

Backbone of the equipment here is a group of 30 Keller machines for profiling and three-dimensional contour machining. The most common application of such machines is ordinarily the making of large automotive dies and similar one-piece operations, whereas here they are employed for production machining—and sizes range from small through medium and large.

To obtain maximum results from the 3-spindle Kellers, Kaiser has developed trunnion and index tooling that permits positioning a part at different angles relative to the spindle. In this way a complete Kellering operation can be performed in one setup, with not only a saving in time but also an increase in accuracy. A forging is thus loaded into

Three-dimensional profiling is required . . .
on these B-52 wing-chord fittings to produce a twist on the long curve. Now machined completely in this setup, these stretch-formed aluminum extrusions previously required 8 different machines. Two different, but similar, parts are machined here, so quantities are sufficient to leave the setup on the machine permanently

equipment

a fixture only once; upon removal, all Keller operations are complete and the coordination errors common to positioning a part a number of times are eliminated.

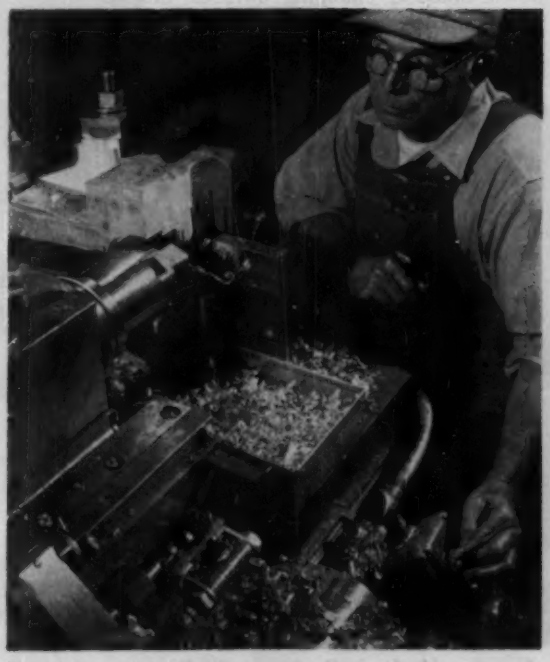
On some of the Kellers, one work-table knee continues working while the other is being set up for a new job; or the tools and parts for one job can remain in the machine while another job is run. With combined setups and ingenious tooling, these machines, running at 10 to 15 sfpm, remain competitive with equipment capable of as much as 30 sfpm.

SPECIAL-APPLICATION EQUIPMENT

Specially designed machines have also proven their worth here. For example, a machine for boring landing-gear trunnions was designed, built, and tried out, all in three months at one-third the cost of a general-purpose machine.

In general, special-application equipment is made to perform particular operations and can therefore be designed simply. General-purpose features can be disregarded and greater emphasis placed on the design features most needed for the job at hand.

Furthermore, there is a definite labor saving when special machines are employed. Some aircraft parts



Special machine plunge cuts rough bore . . .
in aluminum landing-gear trunnion with 4¾-in.-dia, single-blade cutter. Finish bores are machined to about 5 in. dia, 3 in. deep, within a total tolerance of 0.002 in. Another cut made here utilizes a form cutter that feeds radially while spindle feed is held in neutral position

Production machining with die-making equipment . . .

B-52 bulkhead sections are assembled . . . in radial drill setup. Two landing-gear-bulkhead quarter sections are fitted together with tongues in one quarter section fitted to grooves in the other (left). Assembly holes are drilled (right), reamed, then broached through the tongues and grooves to hold size within "tenths" through 6-in. thickness

are so complex that the skills of the most experienced machinists are required on conventional equipment. In the face of a shortage of such skilled help, special equipment has been found particularly valuable, because complex jobs can be handled by semi-skilled operators after a few days of training. Production-scheduling problems common to general-purpose equipment are usually eliminated, as is down time for changing fixtures. Moreover, inasmuch as such machines are developed for one particular purpose, the operations are more efficient.

On the other hand, the versatility of standard machines has also been exploited in this plant. One unique setup puts a standard radial drillpress to work on a broaching and assembling operation—on B-52 landing-gear-bulkhead quarter sections. Tongues and grooves in joining surfaces of two quarter sections are fitted together and then core drilled, reamed, and broached to create assembly holes for a half-section. The resulting assembly-hole size is held to a tolerance of ±0.0007 in. through approximately 6 in. of thickness in the tongue and groove cross section. Core drilling and broaching these assembly holes maintains critical alignment tolerances. In the same setup, legs are assembled to the bulkhead with steel splice plates at the joint.

Forging is checked ultrasonically . . . for deep flaws or inclusions before expensive and time-consuming machining operations are performed on landing gear part. This inspection insures high quality of critical aircraft parts and minimum time lost from performing work on defective material

STANDARD TOOLS AND ADVANCED TECHNIQUES

Throughout the plant, good tooling practice is employed. Remarkable results are obtained, for example, in machining modified 4340 aircraft steel (heat treated to a tensile strength of 240,000 psi) with conventional HSS tools and ordinary water-soluble coolants. Basic speeds and feeds are not out of the ordinary, but the main trick is to maintain an adequate chip load. Average feeds are 1½ ipm with speeds running from 50 to 100 sfpm.

About 30% of the parts produced here are inspected ultrasonically. Frequently, both conventional and precision aluminum forgings are inspected before machining as well as afterward. Two ultrasonic testers are available—a Sperry and an Electro-Circuit.

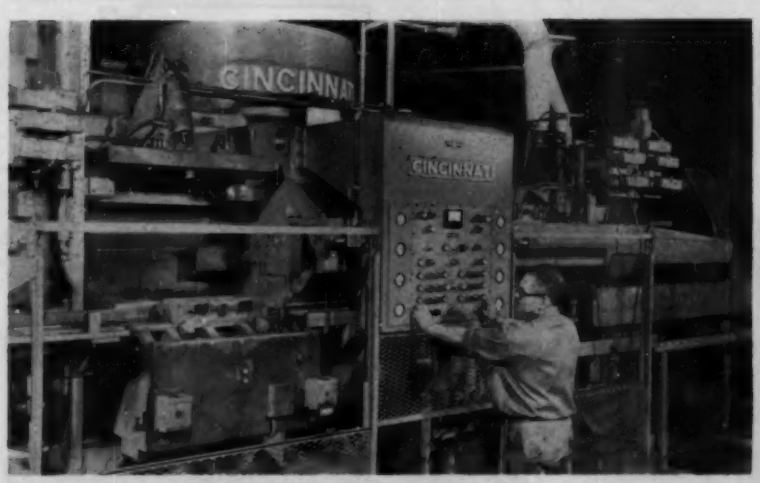
Another advanced technique is found in the preparation of manufacturing routing orders. An IBM system keeps all the latest information on punched cards from which the orders are typed automatically when a production lot is released. Then the order travels with the parts so the shop will have complete and accurate information on the operations to be performed, the tooling, and the allowed time.

DETROIT RE-AUTOMATES FOR '58 PRODUCTION—4

CADILLAC mechanizes for adaptability

GEORGE H DE GROAT,
Detroit editor

Compared to other divisions of General Motors, Cadillac Motor Car Div produces a low volume of stamped parts, and many presses must be tooled with ingenuity so they can be changed over to several different parts. Even so, the division has added 25% to its stamping area, bringing the total to 5 million sq ft. New equipment includes coil feeds, automation between presses, and special parts-handling devices; and the division has added a cylinder-head and engine-block line. They are described and illustrated in this fourth and final article in our current series on automotive retooling



Cylinder heads (and engine blocks) are broached . . . all over in Cincinnati 2-way machine with mechanical drive. First station does top of head, bolt bosses, and exhaust-port pads; second does joint faces and intake flanges. Accuracy here improves later machining operations because surfaces are used for locating

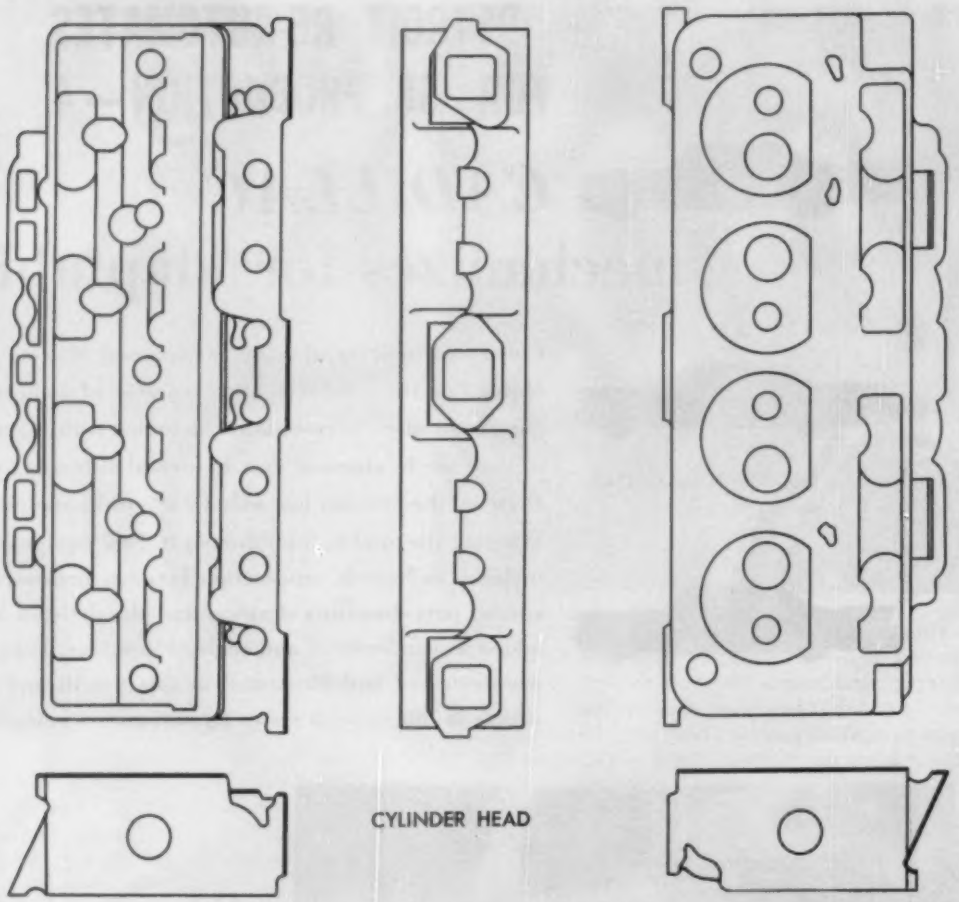
Both cylinder heads and engine blocks are now broached all over at the start of the machining lines. This is a new operation for Cadillac, aimed to improve precision in later machining operations. Parts are unclamped after broaching, then machined again to insure flatness and minimum distortion.

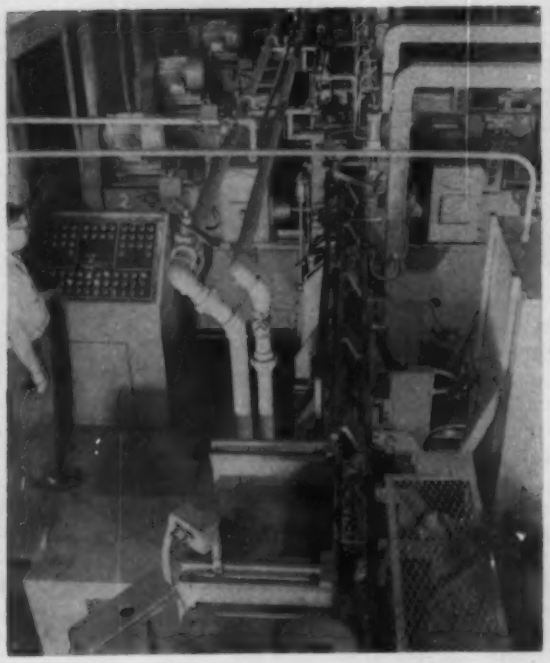
All machining operations except one are now done with an emulsion coolant, which eliminates the dust hazard usually associated with cast iron and reduces blowoff requirements. Parts are therefore cleaner, inspection is easier, and all machining is more efficient. The panrail surfaces on engine blocks, for example, are machined at 78 sfpm now instead of 20 sfpm as previously. All cutting tools are carbide, and tool life generally has increased 100%.

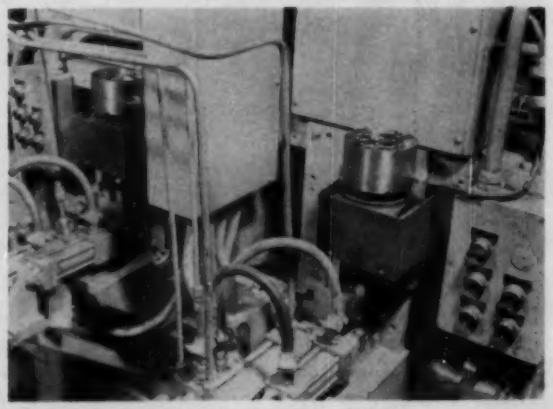
Taps are flooded with coolant, too, to eliminate chip blowout and increase cutting life. Tap use on the block line alone has dropped from well over 600 to under 100 taps per month.

Among new machines in the cylinder-head line are a Cincinnati broach, a Greenlee transfer machine that drills all holes on top and bottom surfaces, a Foote-Burt machine for drilling both ends and rough- and finish-milling combustion chambers, and a Kearney & Trecker transfer miller for the gasket face.

CADILLAC mechanizes for adaptability . . .

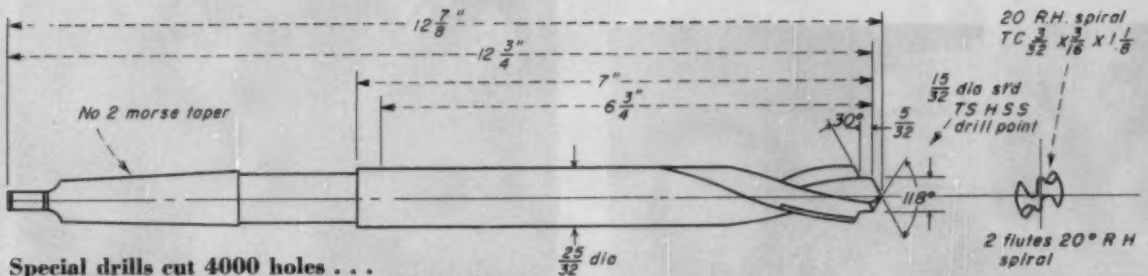




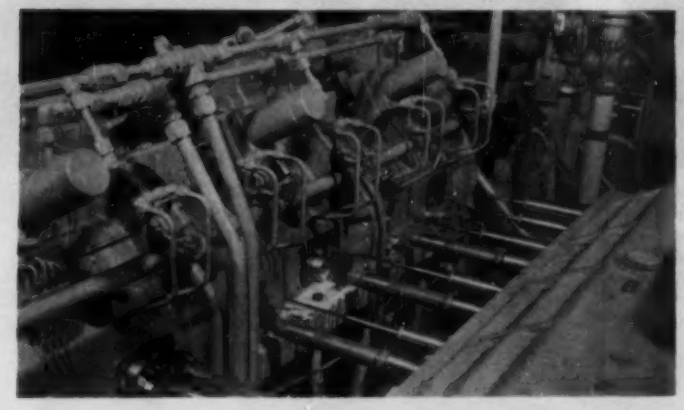


Plugs are automatically assembled . . . into water-circulating holes at 15th Greenlee station. Vibratory hopper feed, hydraulic cylinders, and mechanical linkages do the work

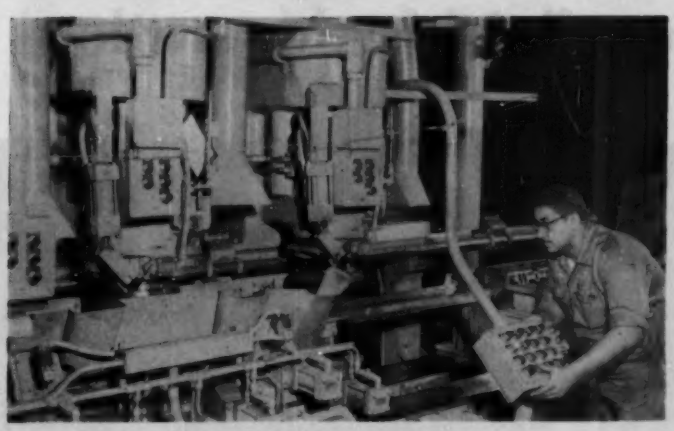
Wet CI machining . . . is new technique on head and block lines. Greenlee 27-station machine drills, countersinks, spotfaces, chamfers, reams, taps, and counterbores. Down toward end of machine the chips are dumped out and the heads turned 107° in horizontal plane for later operations



Special drills cut 4000 holes . . .
in CI instead of only 100 as before. Standard HSS drill is cut back and fitted with carbide inserts to make sub-land design. This eliminates chisel effect that breaks conventional carbide drills

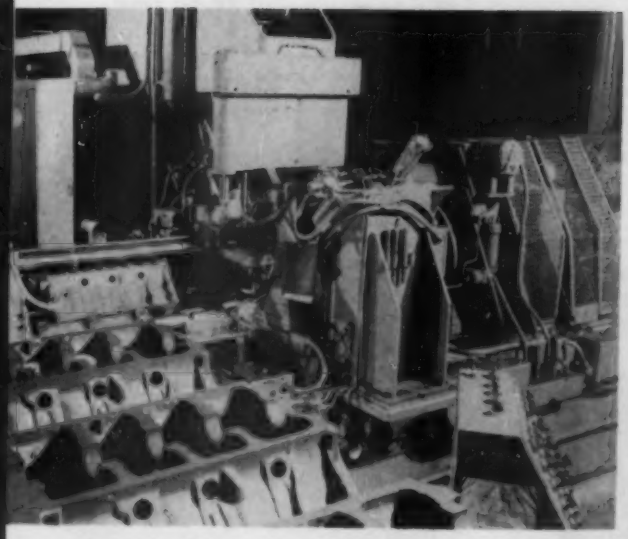


Core drills produce water holes . . .
in cylinder-head ends at 7-station Foote-Burt machine. All operations are wet; counterboring, countersinking, tapping, and probing



Only dry operation . . .
in the line is at Kearney & Trecker miller that takes light cuts to mill cover rails and exhaust-pad faces. Joint and intake faces are also machined. Cylinder heads are double-indexed two at a time through the unit

Heads are manually loaded . . .
onto special Sundstrand machine where welch plugs are automatically spun in place simultaneously at both ends. Operation follows washing, and is among the last performed on the heads



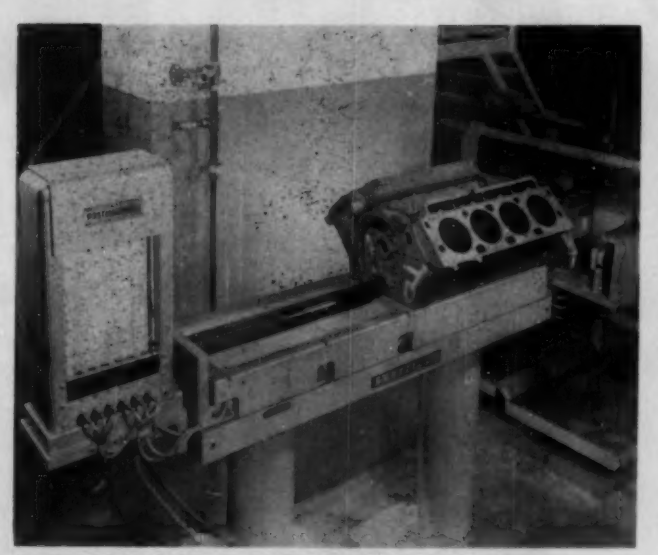
Special construction holes . . .
by which the engine blocks will be located in machines throughout the line are drilled in a Baker machine. Control system is electronic, and includes automatic probes that enter welch-plug holes between cylinder bores on each side of a block to equalize wall thickness within ±0.032 in.

Cylinders are rough-bored early . . .
to prevent stress concentration and insure accurate results later when the bores are semi-finished and when the top cover surface and pan rails are milled. Time lapse before final boring allows slight movement in cylinders as stresses equalize, which means final bore machining will be more accurate

Locating Holes, finishing operations

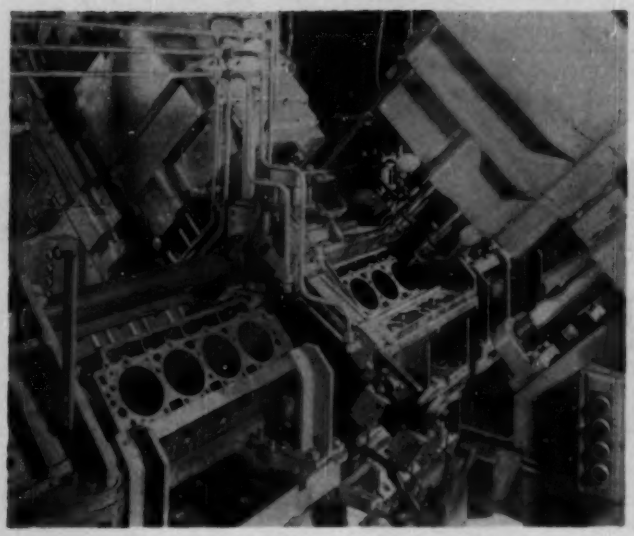
ngine blocks also start off by going through a Cincinnati broach sizing line, then are drilled to produce special locating holes in an electronically controlled Baker machine. A new Ingersoll rough-bores the cylinders, and a Kearney & Trecker transfer machine finish-mills the oil-pan surfaces. Another Ingersoll performs a new semi-finishing operation on the cylinder bores. Blocks are drilled and milled in a new Baush unit.

Crank bores are brought down to a tolerance of 0.0007 in. and their finish is improved to 35 mu in. at a Micromatic hone. Finally, the cylinder bores are "fluid-sized" in new Barnesdril equipment.

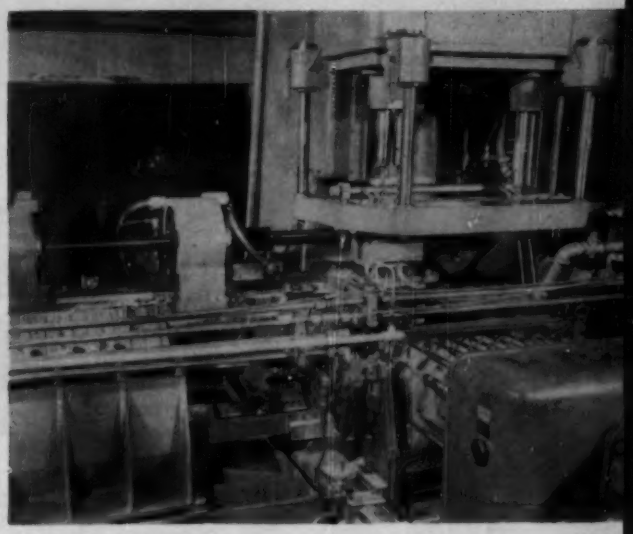


Every fifth block is checked . . .
for flatness of the pan-rail surface within ±0.001 in. Air-gage probes are located in the table on which the block rests for inspection

CADILLAC mechanizes for adaptability . . .

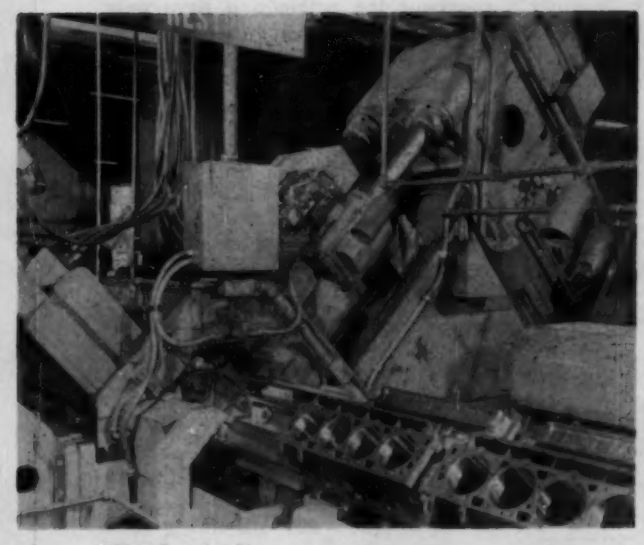


Wet tapping increases tool life . . .
and allows using standard, off-the-shelf tools. Tap usage on block line has dropped from over 600 to less than 100 per month

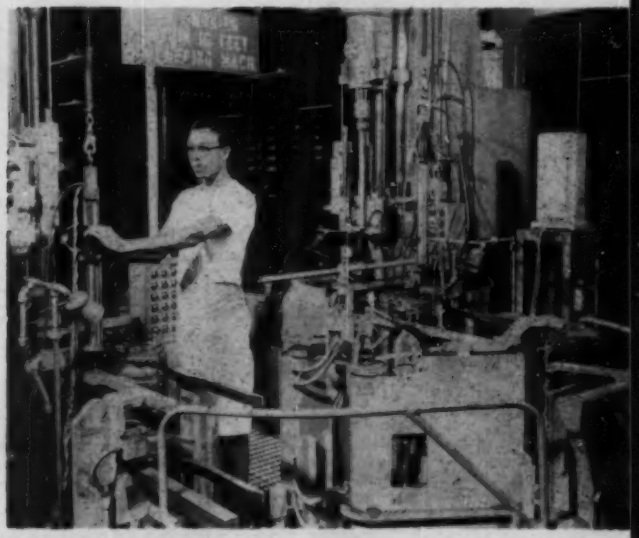


Mechanical transfer . . .
at Baush 24-station machine uses drive screws instead of the more familiar hydraulics to actuate transfer mechanisms. Two screws handle 12 stations each, feeding blocks for drilling, reaming, tapping, chamfering, and milling operations. Motors at each head are equipped with brakes so they do not run continuously which saves spindle and head wear

improve block accuracy

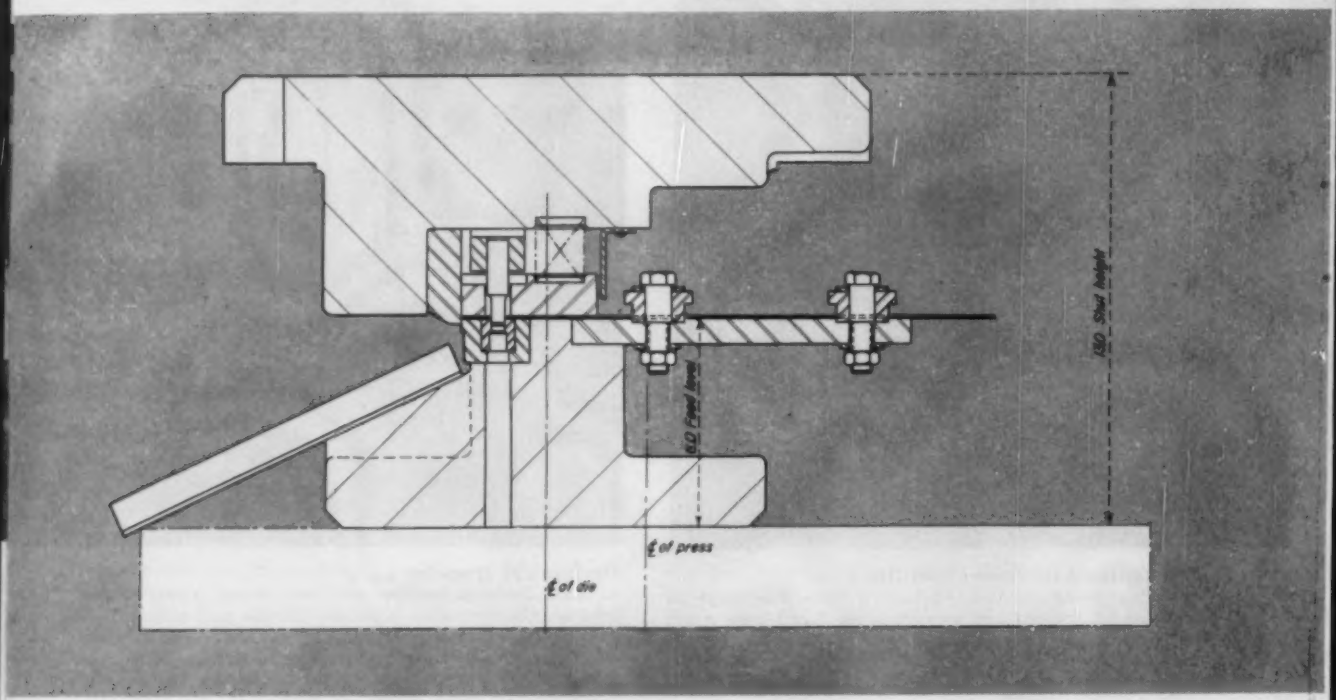


"Fluid-sizing" . . .
at Barnesdril unit works with honing tools that have three orifices each. Honing compound enters the bore through the orifices to produce a specific volumetric pressure that collapses the tool when a predetermined size is reached. Total size spread is 0.002 in., and bores are stamped with code letters to indicate their size for selective assembly with matching cylinders. Pressure switches and electronic controls operate the collapsing hone



Finish-honing on main bearing diameters . . .
is done at vertical Micromatic unit that holds size within 0.0007 in. total tolerance, which reduces selective assembly to a minimum. Blocks are repositioned into vertical alignment for this operation and gaging, then turned over to horizontal for further processing

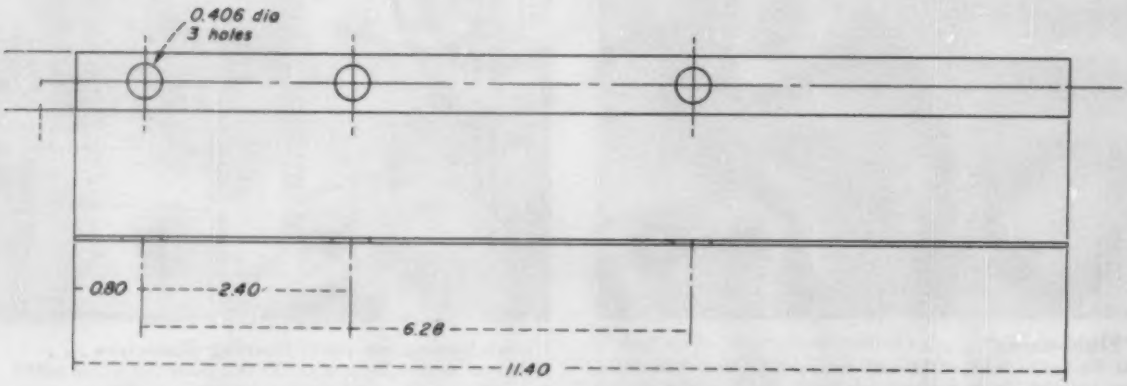
CADILLAC mechanizes for adaptability . . .

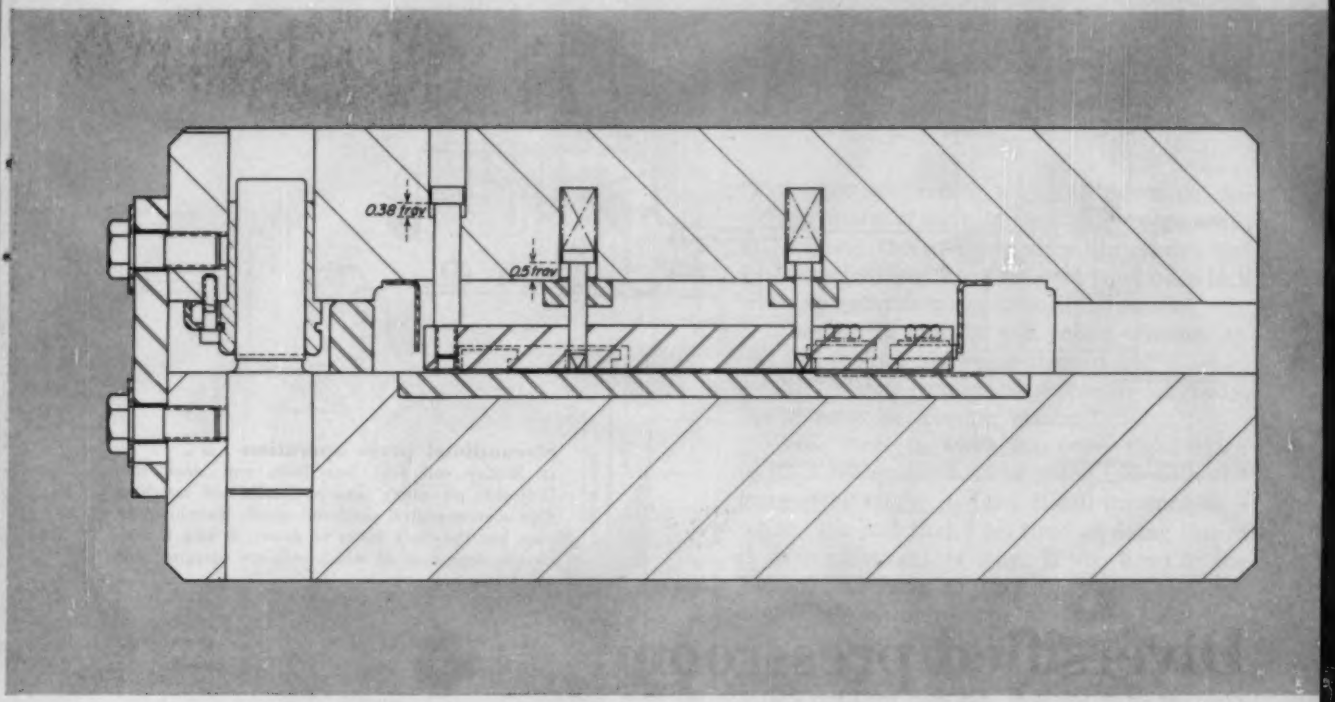


Continuous stamping on "flying press" . . . forms hood-hinge retainer (below), which is 0.0598-in. SAE 1015 with three 0.406-in. holes pierced before cutoff. Die set (above, and at right) has conventional guide posts. Upper and lower dies travel in non-identical paths, but they meet at zero relative speed; and at same actual forward speed as strip

Flying press forms or punches continuously

Operating on a principle similar to that of a flying shear, Wean "flying presses" move conventional die sets along with the stock. Dies remain parallel to each other throughout the action and have only vertical relative motion, as in a conventional press. Upper die moves in circular path, lower die in oscillating arc (see also Chrysler's Wean press—*AM*—Nov 4 '57, p 130). Coil stock is formed at 300 fpm max, and units will take coils up to a 60-in. OD, 20-in. ID, and 36 in. wide.



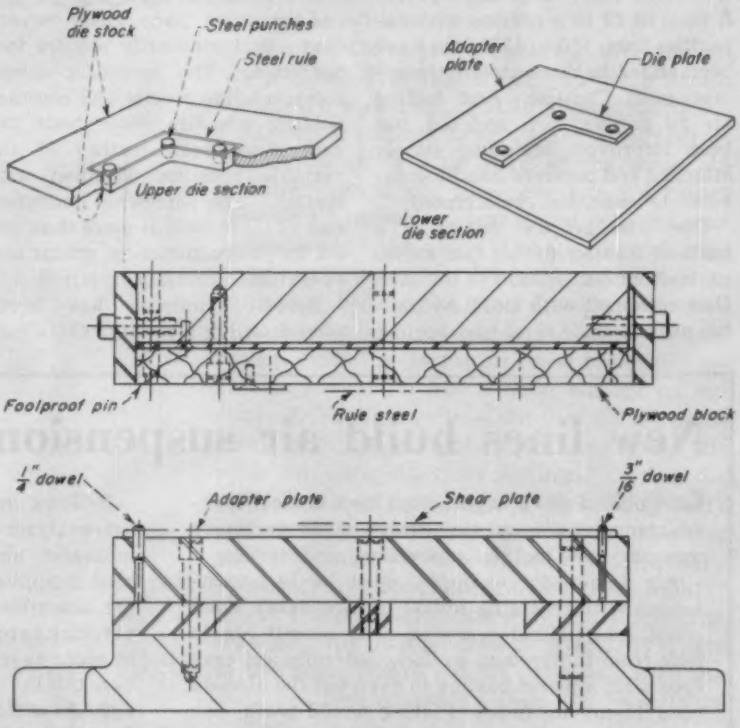


Steel-rule dies trim blanking costs

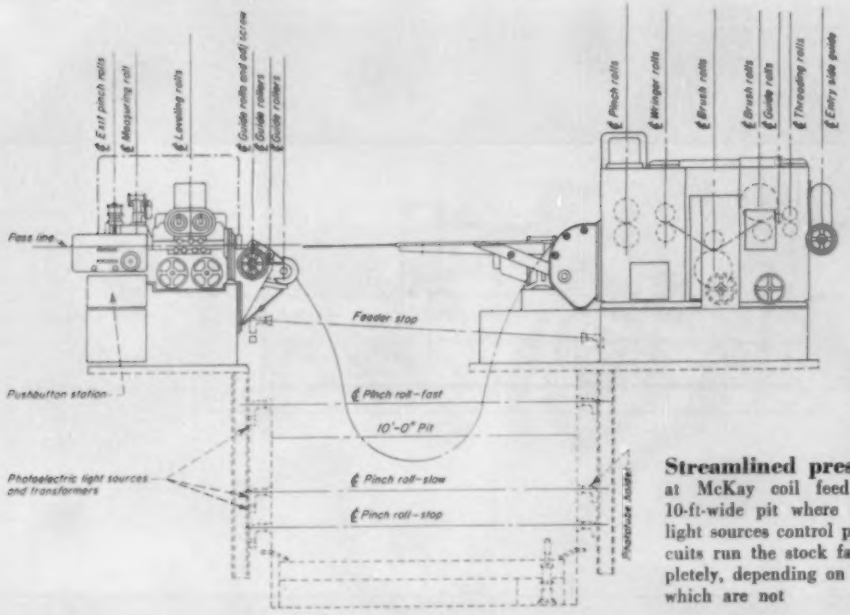
Low-volume flat parts in cold-rolled steel and from 0.062 to ½ in. thick are blanked, pierced, embossed, lanced, formed, and extruded in simple dies made with rule steel and special diemakers' plywood bonded with epoxy resin. Die cost ranges from $50 to $500, about a tenth of that for conventional dies, and the simple dies can be made in a tenth the time. Intricate steel-rule blanking dies may take three days to build, while simple dies—and sample parts from them—can be made in hours.

As permanent tooling they have been used successfully for runs of over 100,000 pc, and several steel-rule dies are often more economical than a single conventional die for a long run. These dies are also useful as stand-by tooling for emergencies and they provide extra capacity during peak runs.

A given die can blank heavy paper or plastic as well as aluminum or steel. Thicknesses up to ¼ in. can be blanked without changing the die clearances. Tolerances are usually acceptable, and the dies can be quickly set up in standard presses.



Steel-rule dies . . .
are made with rule steel of any thickness necessary hardened to 55 R_c. Lower die plate may be ¼ to ⅜ in. thick, mounted on mild-steel backing plate. Ejectors may be rubber strips, or if die is congested they may be regular ejection pins. Special die set has many standard parts



Streamlined press operation . . . at McKay coil feed line loops coil stock into 10-ft-wide pit where four photocells and matching light sources control pinch-roll speed. Switching circuits run the stock faster or slower, or stop it completely, depending on which cells are energized and which are not

Diversified pressroom has changeover tooling

A total of 63 new presses with capacities from 150 to 1250 tons have been added to those already in operation at Cadillac. And tooling for all presses, new and old, has been improved, including simply attached and removed handling devices to ease die replacement.

One unusual die design is a built-in transfer device that moves parts from one station to another. Dies equipped with small hydraulic pistons instead of die springs and pressure pads allow severe draws that ordinarily require two operations. The hydraulic accessories provide precise and constant holding pressure throughout the ram downstroke instead of the variable pressure obtained with springs. The somewhat increased cost of these tools is more than offset by the reduction in setups and operations normally required.

Special emphasis has beeen placed on high quality; extra material is used in drawing to insure clean parts without recoil lines and other forming marks. Die design is stressing reduced maintenance and operating costs.

Both kirksite and plastics have been used on low-volume runs and in proving out new stamping methods. In one case, plastic dies proved whether or not high-quality license-plate holders could be stamped in one piece instead of being made as two parts welded.

New lines build air suspension

Components of air suspensions have critical leak-resistance characteristics, which made necessary unusual new tooling, processing, and testing.

Air domes, for example, must be hydrogen-brazed without losing initial surface finish. Even small longitudinal scratches will permit air to leak from the system, so dome interiors are covered with a prime coating to even out the already good 15-mu-in. finish. Plating would work, except that it accentuates rough spots, which would reduce the high leak resistance necessary.

Bellows must be leak-tested by an accurate gas-analyzer technique at special fixturing that measures air-pressure differential. After silicone is applied to the dome and bellows, the two are assembled in a tricky operation where air pressure expands the bellows so it can be snapped in place over the dome lip. In a previous operation the lip is curled in equipment specially designed for the purpose to produce a leakproof fit.

Leak testing follows in operations newly developed for the new air-suspension system.

Off Like a Shot

***SHOULD** Ed go along with the shop bunch more often, just so they don't think he's too standoffish, or is his own time really his own? Your opinions may help others. Discussions of earlier topics start on page 182.*

"I've been wondering why you never get involved in any of the plant activities after work, Ed. I never thought you were anti-social, but I'm surprised you don't at least bowl once in a while, or maybe play softball in season."

"That stuff's fine for you young whelps, Al, but I'm feeling my years these days."

"Cut it out; you're as active as anybody. There must be another reason."

"Well, there is, when you come right down to it. I really don't mind going out with the gang after work; in fact, I still do once in a while. It's just that I get tired of doing things in such an organized way. If you bowl in the league, you have to turn up every evening, once a week, at just the same time, and you quit at the same time. It's too much of a grind. I get enough at work, Al."

"It's not that bad, Ed. Besides, it might help you get along with the men better if you went along."

"Anybody complain that I haven't been getting along with my men?"

"No, but I was just wondering why you always take off at night like you were afraid somebody would ask you to do something."

"Look, Al; after you've worked a number of years you get a little tired of the same old routine, even if you like your job. I'd rather take off by myself, go home, and do some puttering around the place. I'm not mad at anybody in the plant, but I'd really rather talk to somebody besides the guys I work with each day, at least on my own time. I guess the real reason I don't go in for all these organized activities is that I'd like a little variety on my time off. You'll have to admit that it's the same thing, night after night, if you keep going out with the gang on their outings."

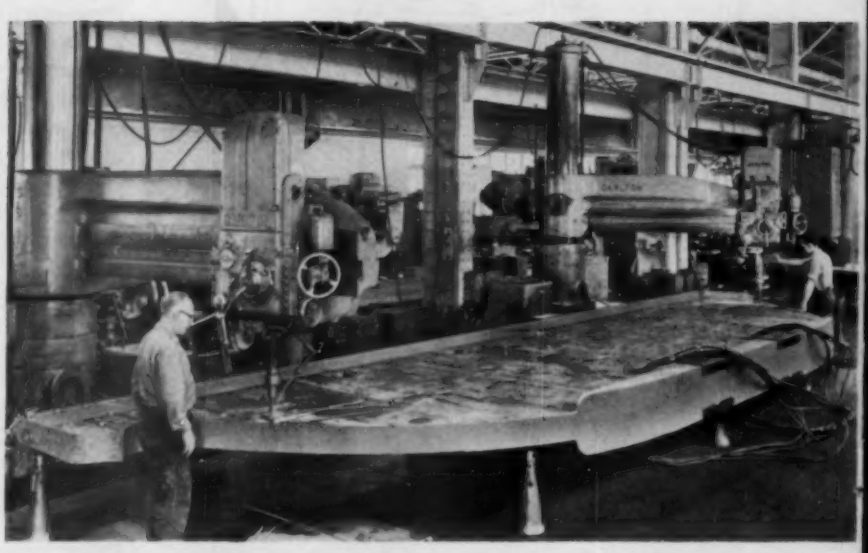
"Well, it's only one night a week, Ed. I don't see what's going to hurt you if you go along with the gang once in a while. Besides, what's so variety-like about going home every night?"

"Al, I know you mean well, but I'd just as soon keep my own off time to myself. If it gets to the point where I don't get along with the men, I'm sure somebody from the front office will tell me about it."

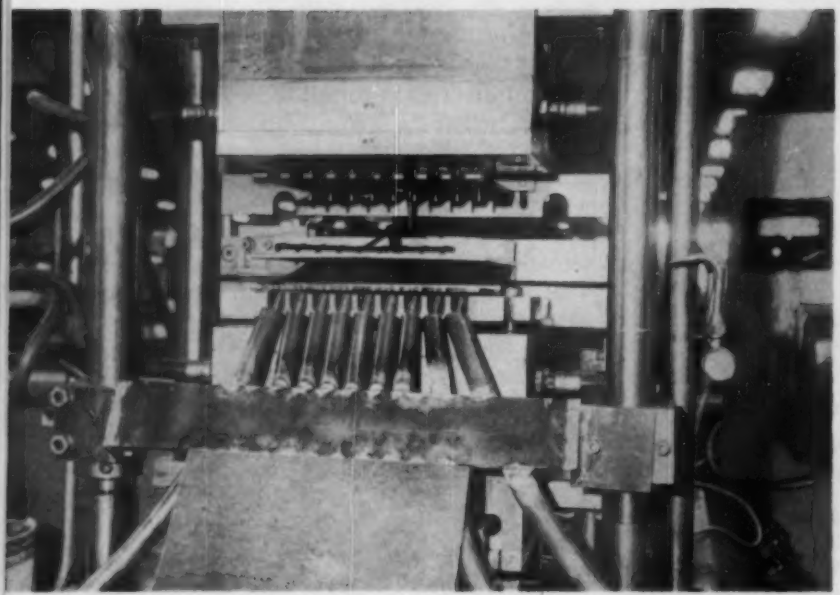
• • •

SHOP SHOTS

Harness board takes less space . . .
ups production 10%, and has saved 200 woman-hr on 21 Computypers (automatic writing-calculating machine that completes bill in one operation). Boards replace old 6-ft benches; are used in conjunction with wheeled tool boxes. *Friden Calculating Machine Co, San Leandro, Calif*



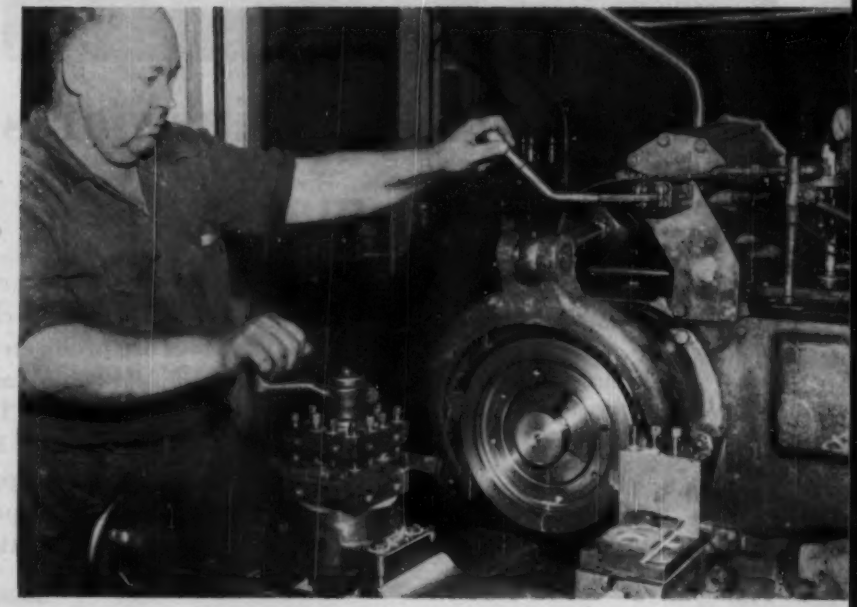
Two track - mounted radial drills . . .
cut 208 holes of various sizes in ram plate of 900-ton press brake; 34 ft long, 10 ft wide, and 7 in. thick, weighing 83,300 lb. Drills are 8-ft Carlton 4A's; did the job in 22 hr with one work setup. Special track mounts included heavy baseplates, four wheels each, and motors for traversing power. *Cincinnati Shaper Co, Whitewater, O*



Number inserts for adding-machine keyboard buttons . . .
are molded, separated from sprues, and sorted into bins by numeral, 1 through 9, at chute-fitted Stokes 2-oz injection press. Unit operates automatically, almost without attendance, saving 85% in man-hr and increasing production 15%. Dieset also pushes sprue and runners into scrap chute. Remainder of flush faces of Tenite butyrate buttons are molded around number inserts at later operation. *Monroe Calculating Machine Co, Orange, N J*

Press-brake flywheel bolted to lathe faceplate . . .
is hoisted to spindle nose of extension-bed gap lathe for demonstration setup. Faceplate and flywheel weigh 2200 lb together. Machine will swing 29-in. work over ways or 52-in. work through gap. *Nebel Machine Tool Corp, Cincinnati*

Four aluminum castings . . .
make up 12½-ton, 28-ft-long milling table for aircraft wing panels. Alcoa aluminum was used because ferrous table would have been too heavy, in this size, for the machine foundation; also because of easier machining. Table quarters were cast over 30-min periods to compensate for metal cooling contraction. Six thermocouples in each mold helped control cooling rate. Material is 355-T7 E9 alloy. *North American Aviation, Los Angeles*



Air replaces muscle . . .
at 5-in. turret lathe, where even a husky operator was not powerful enough to open and close chuck without undue fatigure. Air cylinder and control valve were installed to swing mechanism. *Kingsbury Machine Tool Co, Keene, N H*

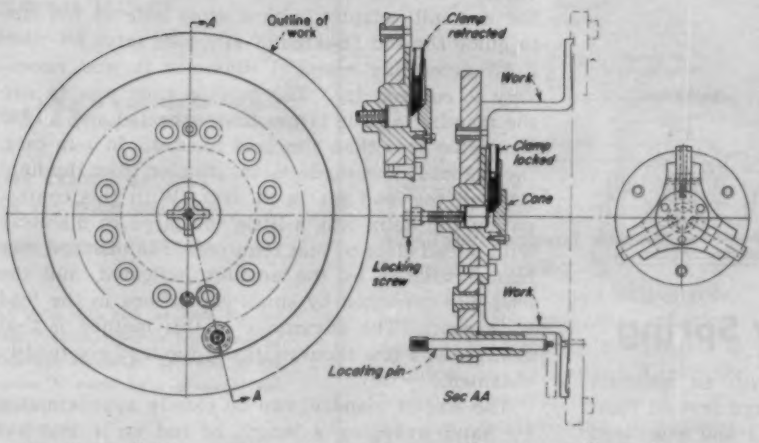
Cement is applied to steel ring . . .
with eyedropper to fill all surface imperfections. Ring ID is accurately machined to high-side tolerance of short hub under workpiece. Weight alone clamps work until cement solidifies

Steel ring is located . . .
inside three pins on lathe fixture, and is held by three clamps. One pin (upper right, under clamp) catches edge of work to drive it against tool-bit pressure, and is sole contact between holding fixture and workpiece

Rubber cement grips parts for free-state machining

JOHN DOW, *supt of mfg,*
Aeronautical Div,
MINNEAPOLIS-HONEYWELL
REGULATOR CO,
MINNEAPOLIS

Delicate dial rings for aircraft control gyros must be finish-faced and bored entirely without clamping pressure to eliminate distortion. The rings are prelocated in strong steel rings, held in place by MMM rubber-base non-hardening cement thinned down 40% with methyl ethyl ketone. The thinned cement will evaporate up to 60% by volume in 4 hr, so parts must be machined within 1 hr after the cement is applied. Parts are glued into the rings, moved to a turret lathe in partitioned wooden boxes, then machined. Cement is removed with solvent, then parts inspected.



Jig Locking Device Speeds Production

Recently, when we received an order for machining a large quantity of castings, a definite need for a drill jig was apparent. We naturally sought to make this tool as quick acting as possible with a minimum of manipulation. The ultimate result is illustrated in the drawings.

This jig is used for drilling twelve 37/64-in. and two 1 7/64-in. dia holes as a last operation in fairly light castings. A centrally located bore through the castings pilots the jig, while a hole previously drilled in the flange locates the jig radially through a locator pin in the outer edge of the jig.

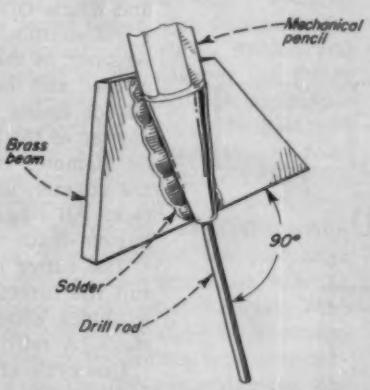
A round piece of boiler plate makes up the body of the jig and carries the drill bushings for the 14 holes, plus a guide for the locator pin. The center bore is sized to suit the clamping arrangement.

The sectional view, AA, illustrates how the two main parts are joined, and how the periphery of the clamping unit pilots the jig in the bore of the casting. This view also shows the function of the clamps in their holding position.

In this position, clamping force is supplied by the clamping screw which bears on a pressure plug. This plug causes the beveled end of the clamps to move down the sides of the truncated cone which faces the pressure plug. Pivot pins, inserted across the clamp channels and through the clamps, give the clamps a rocking motion. As they are moved outward they are also brought to bear on the inside face of the casting.

To release the clamps it is necessary to relax the clamp screw. The springs, inserted between the pivot pins and the spring pockets, will then return the clamps to retracted positions. This is also the position the clamps must assume when the jig is loaded onto the castings. The inset illustrates a clamp retracted.

F A Adams, Dayton, Ohio



Mechanical Pencil Does Duty As Small-Hole Depth Gage

The illustrated tool was created to fill a need that, to my knowledge, cannot be satisfied by anything commercially available. Holes with a 1/16-in. diameter, and sometimes even less, and slots with equally small dimensions, have always been a challenge to depth gaging.

However, this is no longer true in my case. Since this tool was made, I have been able to depth-gage holes and slots as small as the diameter of a pencil lead (standard size lead dia is 0.046 in.). But depth gaging is not its only function. I have also used it as a hook rule in hard-to-get-at places by merely bending the end of the drill rod used in place of the lead.

The drawing makes word of explanation about construction practically unnecessary. But to avoid difficulty, a mechanical pencil of metal construction should be selected. The plastic variety will not stand the soldering-iron heat when the brass cross piece is soldered to the metal tip. It is also desirable to choose a pencil with a long lead capacity. Some of these expel and retract about 4 in.

The lead is replaced by drill rod of the same diameter. Should the dimension to be checked exceed that of the pencil capacity, longer rods can easily be slipped into the pencil. Some of the obvious advantages are: its inexpensiveness, compactness, pocket portability, and built-in protection for the measuring rod by retracting it completely within the body of the pencil.

Boris Smirnoff, White Plains, NY

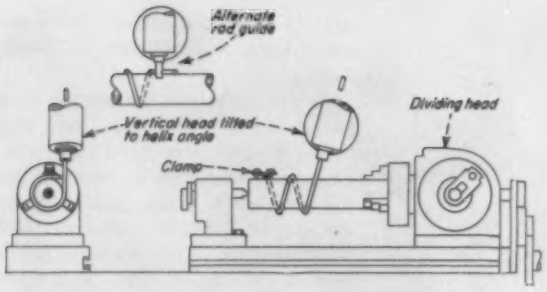
Auger Bit Used in Drillpress

We occasionally have to use a standard auger bit in the drillpress to bore holes in wood. But being dangerous to use as is, because the pilot screw pulls the cutting edges down into the wood too fast, we cut a short piece of copper tubing and thread it onto the pilot screw.

Before an auger bit can be used this way, a pilot hole must first be drilled. For this we use a drill larger than the OD of the tubing to provide clearance, allowing for the elasticity of the wood. To restore the bit to normal use, simply remove the copper tube.

H Miller, Philadelphia, Penna

Practical Ideas



Miller Makes Heavy Spring

Occasionally springs or helixes with an accurate lead are needed. We recently required several right and left hand 3-in. OD helixes of 3 and 4-in. lead made from 5/16-in. dia cold drawn rod. The maximum our largest lathe could produce was a 2-in. lead without introducing other gears into the train. Selecting the correct gearing to allow for springback would have been difficult and would have involved much cut and try.

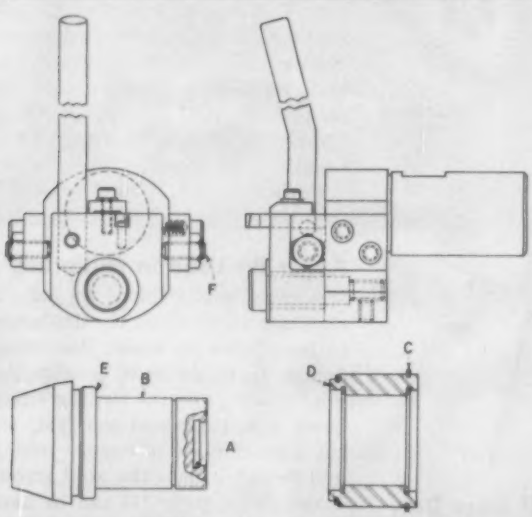
We solved the problem by setting up a lead attachment on a milling machine to drive a mandrel chucked in a dividing head. The rod was fed through the vertical head spindle and was guided by a brass bushing held in the end mill adapter. The vertical head was swiveled to the lead angle, and the spindle placed in neutral so it would not revolve. For long rods, a brass plug can be held in the end mill adapter with a cross hole of rod size to guide the rod (Sketch of alternate setup).

To determine mandrel diameter it was necessary to cut and try. The method used was to size the mandrel a little larger than expected and a lead somewhat less than the lead needed. In our case, the mandrel was made ⅛ in. smaller than the final ID, and the lead set ¼ in. less. With this combination the helix was a little too large in diameter with a lead close to that required. The mandrel was turned smaller by the amount indicated, and the lead was corrected by small corrections in the lead train gears. The advantage of this method is that changes of a few thousandths in the lead are readily obtained.

The size of mandrel can be closely approximated by hand-wrapping a length of rod on a mandrel close to the size required. This can be done by clamping a rod and mandrel in a vise and winding a plain ring. The increase in diameter when the rod is released gives a good measure of the springback to be expected. This increase will be about the same whether the rod is wound as a ring or a helix.

With suitable size machines, rods up to ½ in. could be wound without straining the equipment. The time involved, including setup and mandrel preparations, was less than one shift to produce two helixes each of the four variations required.

M W Loveland, Orinda, Calif



Tooling Aids Salvage Job

Faced with the prospect of scrapping 18,000 subassemblies at a loss of $2.00 per unit plus the cost of reassembly, we went to work to find a way of salvaging the parts. We found they did not function properly in final assembly because of a discrepancy in the undercut A, see sketch. Complete salvage could only be achieved if the undercut could be remachined without removing a drawn cup which had been spotwelded over the end of the cylinder and whose OD was larger than diameter B.

The solution was found in the tooling shown, particularly in the collet adapter. Made in three segments, and held together by retaining rings, it affords ample flexibility to slip over the larger diameter of the drawn cup, allowing it to seat firmly on diameter B. Ring C, having a larger OD than the adapter, also serves as a stop against the collet face. All rings were of the purchased variety, but custom-made rings of the piston ring type will do.

The cutter head was machined with a shank to suit the turret. It employs a lever-operated tilting toolblock which is restricted in its motion by limit stops. A return spring keeps the tool neutral.

One cycle of operations is as follows: The adapter is slipped over the end of the cylinder and onto the diameter B until face D bears on shoulder E. These two are nested as a unit in the collet or self-centering chuck with ring C controlling the depth of entry. After they are securely chucked, the cutter head is brought forward to a preset stop. Here the lever is drawn toward the operator, allowing the tool to cut until stopped by the limit screw F. The lever is then released, and the piece is finished.

William L Kopff, St. Louis, Mo

Practical Ideas

CLIFFORD MOLLOY
Bronx, NY

won **$25** in addition to regular payment for his idea:

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in the Sept 23, 1957 issue

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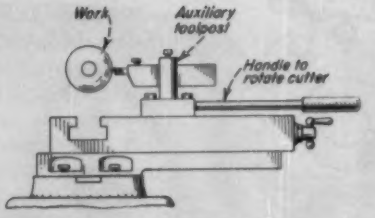
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Auxiliary Toolpost Allows Spherical Turning

Producing true round ball shapes, trunnion balls, and other spherical seating surfaces is no longer a problem in our shop. A simple toolpost mounted on the flat top of our engine-lathe compound makes this a routine job.

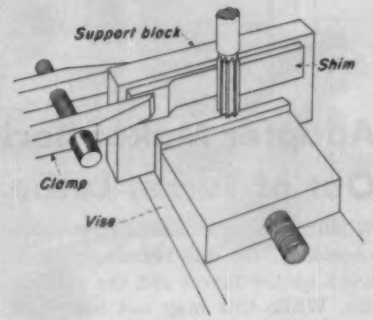
We are fortunate in having a flat-top compound on our lathes, making it easy to mount the auxiliary toolpost. Some lathes employ a round-back compound, but these need not be ruled out as not suitable for applying this idea. Instead, the design is only slightly changed by substituting the flange mount for a longer plate which can be secured in the original toolpost T-slot with perhaps a bolt at the other extreme end of the plate as a holddown.

To get back to the original design—the toolpost is turned in one piece from round stock. It includes a round flange with four holes for mounting. A hole is drilled and tapped in the edge of the flange to receive a handle. A toolholder slot is milled through the post, and a hole is drilled and tapped from the top of the post for a clamping screw.

To set up for spherical machining, the center of the compound indexing plate must be directly below the center of the work. With the compound slide in a neutral position, the cutting tool is mounted in the toolpost, allowing the tool to barely touch the largest diameter of the work at its horizontal centerline.

Using a tool that is ground to cut toward the headstock, the compound holddown screws are loosened, and the compound is rotated clockwise, from the end of the work to the inside, handfeeding by use of the handle. Amount of cut is controlled by the compound feedscrew.

Lewis H Edwards, Wamego, Kansas



Shims Produced in Simple Setup

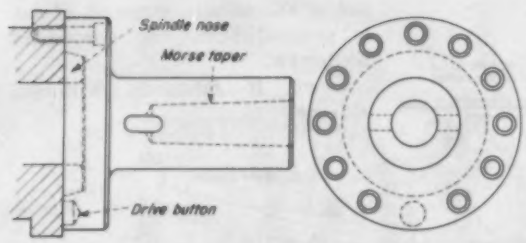
Shim stock has many uses in a machine shop. At one time or another, a certain thickness will not be available when it's needed the most. Making your own shims by standard methods is usually a tedious process, but not so by the setup illustrated. It is a quick and accurate way to get any thickness desired, parallel or tapered.

To make a parallel shim we first grip a block, preferably hardened, in a milling vise secured to the table of a vertical milling machine. The block is indicated to run true with the table travel. The stock for the shim is then clamped horizontally to the side of the block with a parallel clamp. Should it be necessary to remove a lot of stock with one cut, a husky C-clamp may be needed to hold the work. The work cannot be allowed to shift because if it does, a broken end mill is inevitable.

Using a right-hand-rotation end mill, the cutting action takes place from left to right, away from the clamp as shown. One cut will usually be enough to take the stock down to the correct thickness, although several cuts can be taken if desired. If a long shim is needed, both ends should be clamped. Tapered shims are produced by offsetting the vise to the angle called for.

Ottavio Cerullo, East Boston, Mass

Practical Ideas



Adapter Makes Boring Mill Out of Turret Lathe

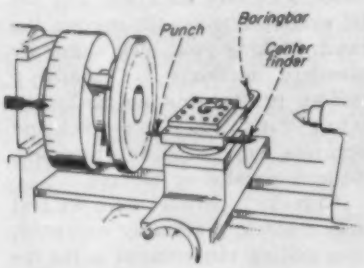
When running jobs on turret lathes it is sometimes necessary, for one reason or another, to locate the work on the turret and the cutting tool in the spindle. While this may not happen too frequently, it is usually unexpected and a rush job when it does come up. If you are prepared for such eventualities, a lot of time will be saved.

We have made adapters to fit the spindle nose of the turret lathe. One adapter (illustrated) employs a Morse taper socket, the size being as large as the maximum-size taper used for this machine, but not to exceed its capacity.

A good grade of steel, capable of taking a heat-treatment, is bored out to fit the spindle as shown. This spindle is the American standard flange type found on most machines today. On machines with a threaded nose the only alteration would be to make the adapter fit the threads.

After the flange has been completed in the lathe and the circle of holes drilled, the piece can be fastened on the turret-lathe spindle and finish-machined in place for the utmost in concentricity. The OD is turned and the end faced off to the proper length. A hole is then bored to the size and taper of the shanks to be used and is finished by reaming. A slot for the drift pin is milled at the end of the bore to complete the job.

Roger Isetts, Kenosha, Wis



Layout Work Eliminated By Indexing Chuck

Flange production represents a good portion of the work output in our shop. Because of this, we have constantly been on the alert for methods of abbreviating operations to cut the cost. The illustrated arrangement does away with one time-consuming operation, the layout work which has to be done after the work has been faced and bored in the lathe.

By scribing indexing lines on the periphery of the chuck, a flange can be indexed and the hole location marked before it is released. Enough indexing lines are scribed and stamped to handle all divisions likely to be encountered. A pointer is fashioned from sheet metal and attached to the headstock with a machine screw.

A special holder, in which a punch is mounted in the forward end and a scriber in the other, is clamped in square toolpost turret. The holder is so lined up that when the pointer is dead center with the tailstock the punch will be centered on the work. Facing and boring tools occupy other positions on the turret.

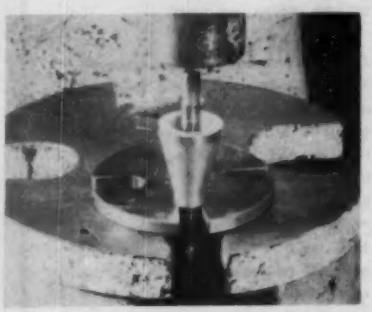
After the center of the work has been found it's easy to arrive at the bolt circle. By use of the cross-slide, the feed screw is turned to move the compound toward the operator until the calibrations register the proper radius. Should a bolt-circle scribe mark be desired, the punch is touched to the face of the work as it is rotated. Divisions are marked off by setting the sheet-metal pointer on the proper indexing mark on the chuck, after which the punch is bumped against the work face. This is repeated for each hole location.

Ben Brown, Bridge City, Texas

Soldering Iron Indents Plastic

When we have a series of holes to drill in plastic we mark our hole locations with the pointed end of a hot soldering-iron tip. This makes a much better indentation to start a drill accurately than one made with a centerpunch.

H Josephs, Gardenville, Penna



Auxiliary Platen Saves Time

One of the most convenient devices made in our shop is the illustrated auxiliary platen which we use in our arbor press. It was formerly necessary to use bushings, blocks, or scrap stock to support work over the large openings in the platen supplied with the press.

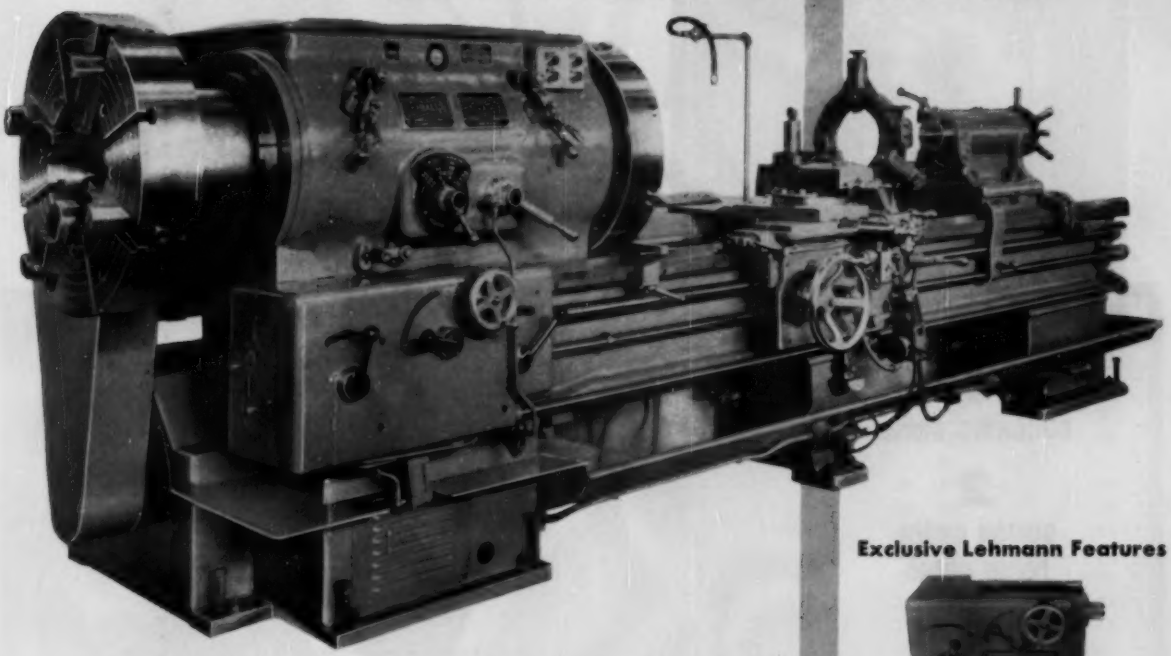
The small platen was made from a round piece of steel plate. Slots of varying widths were bandsawed into the face of the plate. A stud was pressed into the center of the platen, and a hole was drilled into the large platen on the press to receive this stud.

The small platen easily revolves to present an opening of desired size, and it may just as easily be removed to make room for work to be placed directly on the larger platen.

H J Gerber, Stillwater, Okla

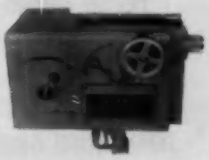
Lehmann Hollow Spindle Lathes

In Standard Sizes or Built to Specifications



Illustrated above is a standard Lehmann 25"Hollow Spindle Lathe. Even an inexperienced operator can machine like an expert with this "automated" Lehmann. Three forward spindle speed changes in each of 4 sub-ranges within overall 12 spindle speed range of the lathe can be effected merely by moving speed selector handle on the headstock and without stopping lathe spindle or moving any manual shifter handles. Hydraulic Quick Change and Fast Threading Attachment (described below) add to the speed, ease, and economy of operation. Lehmann manufactures a complete line of Hollow Spindle Lathes with spindle holes from 3½" to 19½" diameter. Larger holes and custom-built lathes upon request.

Exclusive Lehmann Features



HYDRAULIC QUICK CHANGE with synchronized index gives 54 changes of feeds and threads hydraulically and automatically. Unit fully enclosed. Anti-friction bearings for all revolving members.

FAST THREADING ATTACHMENT reduces threading time. Safely disengages and stops tool automatically at same place, regardless of speed or closeness to shoulder. Simultaneously disengages half nuts and backs out tool on contact with automatic stop.

Lehmann Hollow Spindle Lathe with Center Mounted Headstock.

Write today for FREE new Lehmann Hollow Spindle Lathe catalog.

Lehmann Lathes Built to fit your specifications

For maximum production in your plant, Lehmann will build a hollow spindle lathe with the special features you need. Pictured is a special purpose lathe with center mounted headstock arranged for working at both ends of the workpiece simultaneously maintaining concentricity.

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ROUGH GRIND
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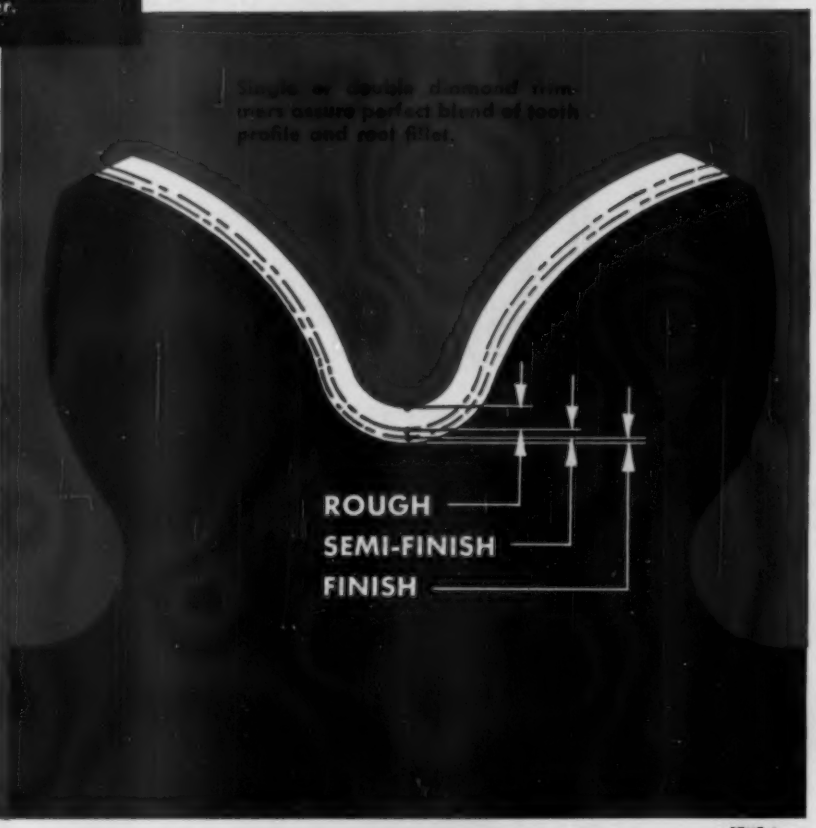
Choose from any of the above four methods (with selective feed increments) depending on your requirements.



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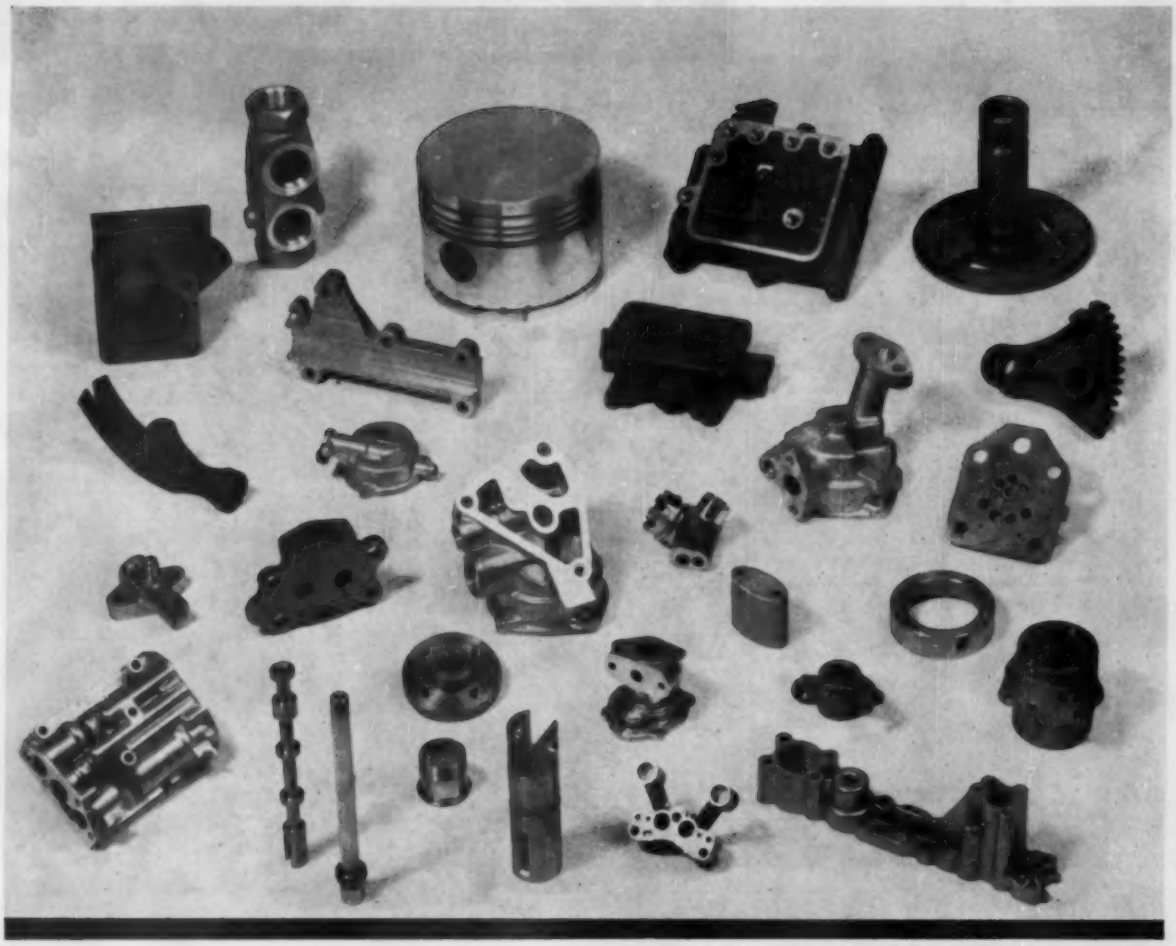
Relative Hardness of Metals

Typical hardness values of metals before and after heat-treatment or other processing are helpful. Approximate hardness equivalents are given in terms of the Rockwell, Brinell, and Sclerescope tests

H L CAMPBELL, metallurgical engineer

	Brinell		Rockwell			Scl.
	Mm.	No.	C	A	B	No.
Hardened high-speed steel	2.25	745	65	84	—	90
Casehardened surfaces	2.30	712	63	83	—	87
File hard	2.35	682	62	82	—	84
	2.40	653	60	81	—	81
Cutting tools	2.45	627	59	81	—	79
Chilled cast iron	2.50	601	58	80	—	77
	2.55	578	57	80	—	75
1075 steel hammers	2.60	555	56	79	—	73
Brittle range above	2.65	534	54	78	—	71
	2.70	514	52	77	—	70
1060-steel spring washers	2.75	495	51	76	—	68
	2.80	477	50	76	—	66
1040-steel flame hardened	2.85	461	49	75	—	65
	2.90	444	47	74	—	63
Steel springs	2.95	429	46	73	—	61
Abrasive wear above	3.00	415	45	73	—	59
	3.05	401	43	72	—	58
	3.10	388	42	71	—	56
	3.15	375	40	71	—	54
3140-steel, hard. & tempered at 900 F.	3.20	363	39	70	—	52
	3.25	352	38	69	—	51
	3.30	341	37	69	—	50
Difficult to machine alloy steel above	3.35	331	36	68	—	48
	3.40	321	34	68	—	47
	3.45	311	33	67	—	46
	3.50	302	32	66	—	45
1095-steel, hot rolled	3.55	293	31	66	—	43
	3.60	285	30	65	—	42
	3.65	277	29	65	—	41
R R rails (0.75%C)	3.70	269	28	64	—	40
3140-steel, temper 1200 F.	3.75	262	27	64	—	39
1045-steel crankshafts	3.80	255	25	63	—	38
	3.85	248	24	63	—	37
H T carbon steel gears above	3.90	241	23	62	100	36
Cold-worked 1010-steel brittle above	3.95	235	22	61	99	35
	3.00	229	21	61	98	34
	4.05	223	—	—	97	33
	4.10	217	—	—	96	33
Gray cast iron	4.15	212	—	—	96	32
	4.20	207	—	—	95	32
Maximum for steel to be welded	4.30	197	—	—	93	30
	4.40	187	—	—	91	28
Best machining steel	4.50	179	—	—	89	27
1040-steel, hot rolled	4.60	170	—	—	87	26
	4.70	163	—	—	85	25
1025-steel, cold-rolled strip half-hard	4.80	156	—	—	83	24
	4.90	149	—	—	81	23
1025-steel, hot rolled	5.00	143	—	—	79	22
	5.10	137	—	—	76	21
1020-steel, hot rolled	5.20	131	—	—	74	20

American Machinist REFERENCE



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Whether you make automotive, plumbing, hardware, machine, electrical appliance or some other kind of parts, investigate the production and cost benefits in doing the drilling and tapping on a Kingsbury. Send your requirements and questions to Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY

INDEXING AUTOMATICS
for high production drilling and tapping

Standard Grooved Pins . . I

These standard grooved pins, already adopted by the SAE, now are incorporated in a revised American Standard on machine pins, to be published by the ASME

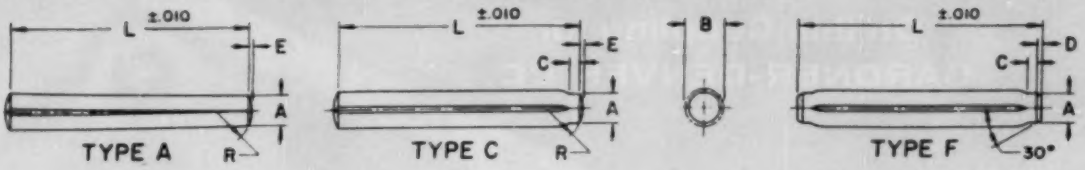
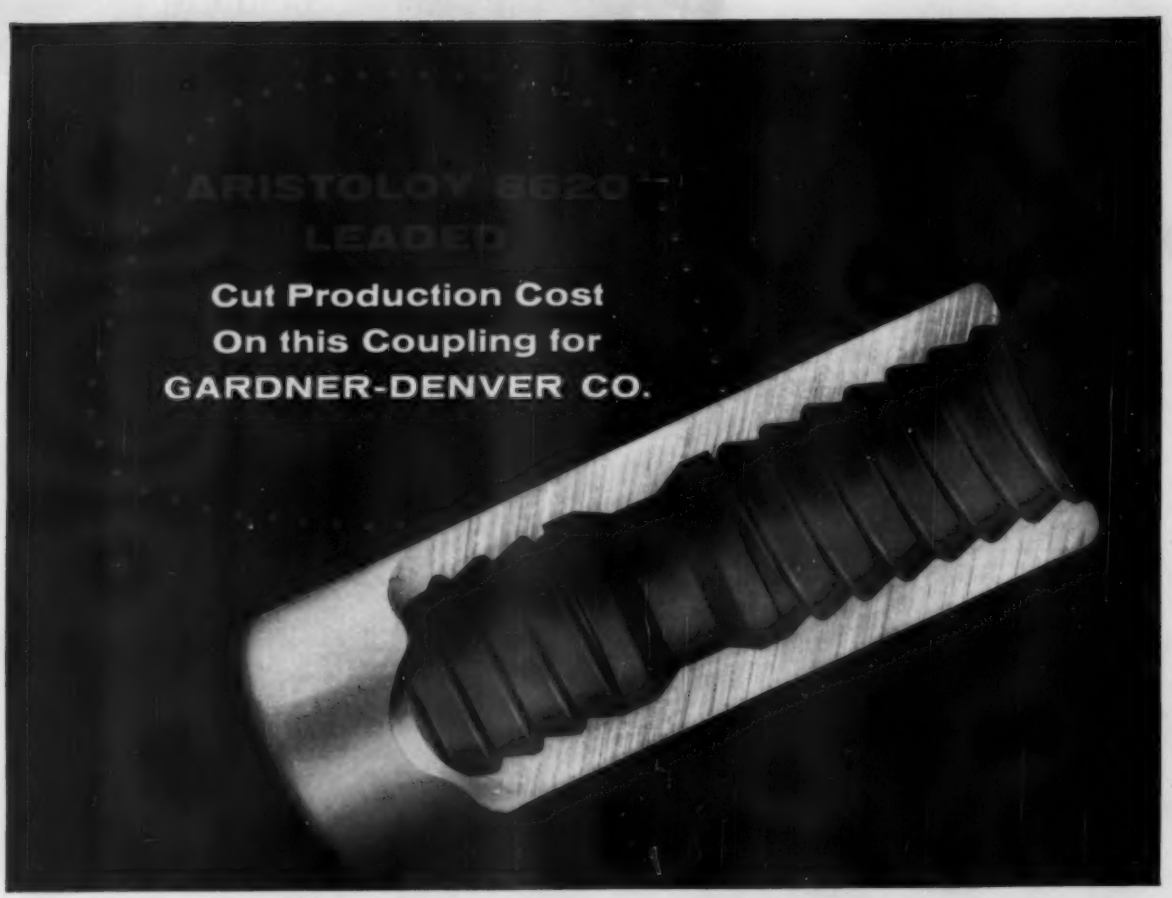


TABLE 2–*Types A, C and F Grooved Straight Pins*

NOMINAL SIZE, IN.	3/64	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Diameter *A*, Max.	0.0469	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Diameter *A*, Min.	0.0459	0.0615	0.0771	0.0928	0.1084	0.1230	0.1543	0.1885	0.2168	0.2480	0.3105	0.3730	0.4355	0.4980
Recommended Hole, Max.	0.0478	0.0640	0.0798	0.0956	0.1113	0.1271	0.1587	0.1903	0.2219	0.2534	0.3166	0.3797	0.4428	0.5060
Recommended Hole, Min.	0.0468	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Crown Height *E*, In.	0.0000	0.0065	0.0087	0.0091	0.0110	0.0130	0.0170	0.0180	0.0230	0.0260	0.0340	0.0390	0.0470	0.0520
Radius *R*, ±0.010	—	5/64	3/32	1/8	9/64	5/32	3/16	1/4	9/32	5/16	3/8	15/32	17/32	5/8
Pilot Length *C*, In.	—	1/32	1/32	1/32	1/32	1/32	1/16	1/16	1/16	1/16	3/32	3/32	3/32	3/32
Chamfer *D*, (Type F)	—	1/64	1/64	1/64	1/64	1/64	1/32	1/32	1/32	1/32	3/64	3/64	3/64	3/64

LENGTH, IN.	*B* Diameter, Max and Min Limits (Measured with ring gages), In.													
1/8	0.052 0.050													
3/16	0.052 0.050													
1/4	0.052 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.132								
3/8	0.052 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.132	0.168 0.164	0.200 0.196						
1/2	0.052 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.132	0.168 0.164	0.200 0.196	0.232 0.228	0.265 0.261				
5/8	0.052 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.132	0.168 0.164	0.200 0.196	0.232 0.228	0.265 0.261	0.331 0.327			
3/4		0.069 0.067	0.085 0.083	0.102 0.100	0.117 0.115	0.136 0.132	0.168 0.164	0.200 0.196	0.232 0.228	0.265 0.261	0.331 0.327	0.396 0.392		
7/8		0.069 0.067	0.085 0.083	0.102 0.100	0.117 0.115	0.135 0.131	0.167 0.163	0.200 0.196	0.232 0.228	0.265 0.261	0.331 0.327	0.396 0.392	0.461 0.457	
1		0.069 0.067	0.085 0.083	0.102 0.100	0.116 0.114	0.135 0.131	0.167 0.163	0.200 0.196	0.232 0.228	0.265 0.261	0.331 0.327	0.396 0.392	0.461 0.457	0.527 0.523
1-1/4				0.102 0.100	0.116 0.114	0.134 0.130	0.166 0.162	0.199 0.195	0.232 0.228	0.265 0.261	0.331 0.327	0.396 0.392	0.461 0.457	0.527 0.523
1-1/2						0.134 0.130	0.166 0.162	0.199 0.195	0.231 0.227	0.264 0.260	0.331 0.327	0.396 0.392	0.461 0.457	0.527 0.523
1-3/4							0.165 0.161	0.199 0.195	0.231 0.227	0.264 0.260	0.330 0.326	0.395 0.391	0.461 0.457	0.527 0.523
2							0.165 0.161	0.198 0.194	0.231 0.227	0.264 0.260	0.330 0.326	0.395 0.391	0.460 0.456	0.527 0.523
2-1/4								0.198 0.194	0.231 0.227	0.264 0.260	0.330 0.326	0.395 0.391	0.460 0.456	0.526 0.522
2-1/2									0.230 0.226	0.263 0.259	0.329 0.325	0.395 0.391	0.460 0.456	0.526 0.522
2-3/4									0.230 0.226	0.263 0.259	0.329 0.325	0.395 0.391	0.460 0.456	0.526 0.522
3									0.229 0.225	0.262 0.258	0.329 0.325	0.394 0.390	0.459 0.455	0.525 0.521
3-1/4										0.262 0.258	0.328 0.324	0.394 0.390	0.459 0.455	0.525 0.521
3-1/2											0.328 0.324	0.393 0.389	0.458 0.454	0.524 0.520
3-3/4												0.393 0.389	0.458 0.454	0.524 0.520
4												0.392 0.388	0.457 0.453	0.523 0.519
4-1/4												0.392 0.388	0.457 0.453	0.523 0.519
4-1/2													0.456 0.452	0.522 0.518

American Machinist REFERENCE BOOK SHEET



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OVER ⅓ LONGER TOOL LIFE ON 3 OPERATIONS

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Spindle Speed R.P.M.	246	301
Feed I.P.R.	.0081	.0081
Machine Speed S.F.M.	120	150
Drill Speed S.F.M.	65	80
Minutes Per Piece	1.59	1.29

Tool Life Increased 35%

TURRET LATHES

	A.I.S.I. 8620	Aristoloy 8620 Leaded
Spindle Speed R.P.M.	296	496
Feed I.P.R.	.021	.021
Machine Speed S.F.M. (drilling & boring)	85	118
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Tool Life Increased 35%

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Standard Grooved Pins . . II

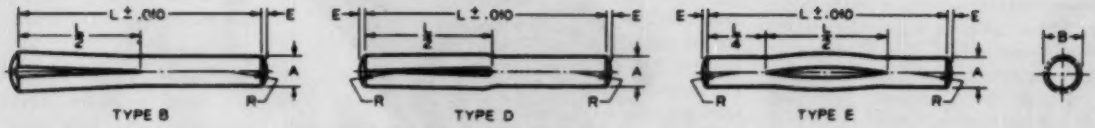

TABLE 1–*Types B, D and E Grooved Straight Pins*

NOMINAL SIZE, IN.	3/64	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Diameter *A*, Max.	0.0469	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Diameter *A*, Min.	0.0459	0.0615	0.0771	0.0928	0.1084	0.1230	0.1543	0.1858	0.2178	0.2490	0.3106	0.3730	0.4355	0.4990
Recommended Hole, Max.	0.0478	0.0640	0.0798	0.0956	0.1113	0.1271	0.1587	0.1903	0.2219	0.2834	0.3166	0.3797	0.4435	0.5060
Recommended Hole, Min.	0.0466	0.0623	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Crown Height *E*	0.0060	0.0060	0.0067	0.0091	0.0110	0.0130	0.0170	0.0180	0.0230	0.0260	0.0340	0.0390	0.0470	0.0630
Radius *R*, ±0.010	—	5/64	3/32	1/8	9/64	5/32	3/16	1/4	9/32	5/16	3/8	15/32	17/32	5/8

LENGTH, IN.	*B* Diameter, Max and Min Limits (Measured with ring gages), In.													
1/4	0.053 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133								
3/8	0.053 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196						
1/2	0.053 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261				
5/8	0.053 0.050	0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327			
3/4		0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393		
7/8		0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	
1		0.069 0.067	0.085 0.083	0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
1-1/4				0.102 0.100	0.118 0.116	0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
1-1/2						0.136 0.133	0.168 0.164	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
1-3/4							0.167 0.163	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
2							0.167 0.163	0.200 0.196	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
2-1/4								0.199 0.195	0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
2-1/2									0.233 0.230	0.268 0.261	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
2-3/4									0.331 0.327	0.364 0.360	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
3									0.331 0.327	0.364 0.360	0.331 0.327	0.396 0.393	0.461 0.457	0.527 0.523
3-1/4										0.364 0.360	0.330 0.326	0.395 0.391	0.461 0.457	0.527 0.523
3-1/2											0.330 0.326	0.395 0.391	0.461 0.457	0.527 0.523
3-3/4												0.395 0.391	0.460 0.456	0.527 0.523
4												0.395 0.391	0.460 0.456	0.527 0.523
4-1/4												0.395 0.391	0.460 0.456	0.526 0.523
4-1/2													0.460 0.456	0.526 0.522

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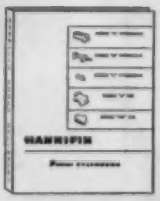


Talking Shop...

Turtle Talk

A TITANIUM specialist at DuPont found himself mixed up with sea turtles recently. The result: a titanium shell tag so that movements of the marked specimens can be traced over the years ahead.

Source for Technicians

MANY READERS have a hobby, or cause, that they devote their time to when they leave the plant. At lunch the other day in a plant cafeteria in Philadelphia we learned of such a cause and in the course of it, we learned a good deal about the Williamson Free School of Mechanical Trades at Media, Pa. This remarkable school is a free boarding school for boys from 16 to 19. The three-year course includes academic and technical subjects, aims at turning out men with somewhat less formal training than an engineer (though more practical shop experience) yet a good deal more technical knowledge than the public high school. The graduates are well-fitted to ease engineering shortages by taking on the technician's part of the job. We have a hunch, though, that a lot of Williamson graduates don't stop at that role. Oddly, here is one school that isn't appealing for funds this year. Endowed in 1888 by Isaiah Williamson, the school has a 225-acre campus and 160 students. With a recent grant from the Wannamaker Foundation, they are putting up five new buildings. Their principal need at the moment seems to be applicants. Last year they had 180, but only 62 met their standards. They would have liked to take a few more and by the time the expansion program is finished, they'll be able to use many more. We'd also suggest them as a place to look for men for your plant, though their graduates seem pretty much in demand. As our informant said, "The Williamson School is either famous or you've never heard of it." We had never heard of it, but now we have. And so have you.

Soap Standards Won't Do

IVORY SOAP PURITY used to be an unofficial standard of perfection. Not so anymore says Tom Hallowell, prexy of Standard Pressed Steel Co. Speaking at an American Management Assn luncheon, he pointed out that if the Atlas ICBM 300,000 parts each had a reliability of only 99.44% not a single missile would ever reach its destination! The resulting overall reliability, believe it or not, would be an infinitesimal decimal fraction—a decimal point followed by 731 zeros followed then by a two. With only 99.44% purity, Atlas builders would be limited to 411 critical components to have one chance in ten of getting the missile to its destination. With the assumption that a failure in any one of the 300,000 parts can mean total failure, each part must have a reliability for the mission of 99.99996%.

The grim facts are that at the critical moment we may have a chance to push only one button and that one missile or anti-missile must work—there won't be time to push a second button if the first one fails.

Reliability, Mr Hallowell said, is not just the province of the missile makers. It's much more widespread in its importance. As we race at higher speeds in our various forms of transportation, that button operating the first time we need it may save our lives. Failure of a tiny component in the family deep freeze can cause not only a waste of food but illness too.

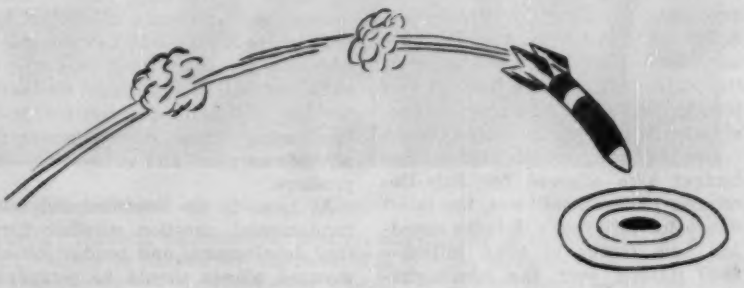
In every field, from atomic energy to household appliances, the demand for reliability is rapidly accelerating. Industry must meet the challenge or admit that modern "conveniences" are something less than convenient; that producibility is a brake on engineering. Neither of these premises is tolerable.

Call for Research

CELEBRATING the 10th anniversary of its founding, the Southwest Research Institute, held a conference on the Southwest and the next decade. While the expected emphasis was put on the industrial potential of this area, most of the conferees seemed to be entering a plea for more basic research. Dr C C Furnas said that few industrial labs indulge in basic research, because they are so involved in being practical. But there is ample evidence that nearly all fundamental knowledge ends up being practical. We suffer from timidity in playing the long shots.

Need A Library?

TURNING TO A MORE practical form of research, there are few metalworking plants that wouldn't benefit from a specialized library designed especially for its needs. If you don't have one, but wish you did, you'll be interested in knowing that the Special Libraries Association has a nationwide consulting service to help in the development of special libraries or information centers. The service is free, and if you don't have a library now, we'd suggest you write to the association (31 E 10th St, New York 3, NY) and find out more about what you would have to do and what it would cost you to start a library to meet your own special needs.



NEWS REPORT

Tight Defense Pursestrings Loosen

But Boosts Will Be "Exceedingly Selective"—Meaning Mostly for Missiles

WASHINGTON — The Eisenhower Administration has abruptly switched signals on defense policy. After weeks of playing down the significance of Sputnik and other Soviet rocket exploits, Washington has suddenly halted the prolonged squeeze on defense expenditures and laid out plans to step up military spending.

For producers of military hard goods, the outlook has suddenly changed from one of bleakness to brightness. But the expenditure boosts will be exceedingly selective.

Administration spokesmen stress that there will be new production cuts—probably in aircraft, guns, vehicles, ammunition, and the like—to offset hikes in missile spending. Still, total sums for defense will rise.

Ike Speech Turning Point

The President's Nov 13 speech in Oklahoma City—with its emphasis on "very considerable" increases in defense costs—was the turning-point in the policy reversal.

But even before, there had been signs of Washington's intensifying reaction to Sputnik: The unloosening of old budget restrictions on missiles and basic research, the move to pool weapon development within NATO, the appointment of MIT's James R Killian as the President's Special Assistant to spearhead increased federal participation in scientific research, the overhaul of Pentagon missile management (see page 87).

Against the backdrop of the administration's turnabout in defense policy, the military budget for fiscal 1959 is shaping up:

- The Pentagon has given up all pretense of sticking to its $38-billion expenditure ceiling for fiscal 1958. A $200-million budget hike for January-June 1958 expenditures is in the works, taking more heat off major aircraft and missile projects previously in line for new stretchouts.

Coming on top of the $400-million budget hike allowed for July-December 1957 expenditures, the latest figure for this year's defense spending now comes to $38.6 billion—$600 million over the administration's original ceiling but still some $2 billion under the spending level at the time the budget squeeze began earlier this year.

- The Defense Dept is hastily reshuffling priorities for major programs under the President's new course for pushing up operational target dates for ballistic missiles, increased SAC base dispersal, beefing up radar warning lines, and pay boosts for military personnel. To offset the added new costs, other programs will be slashed. Some big military bases will be closed; force levels will be cut another 100,000 men next year, bringing total military manpower down to 2.5 million servicemen, 300,000 under the force level five months ago.

As *American Machinist* went to press, Pentagon consensus was that fiscal 1959 spending will total about $39 billion—only some $400 million over this year.

But requests for new appropriations seemed headed for about $40 billion. This is $2 billion over the administration's pre-Sputnik budget plans. The three services have come up with total new money requests of $41 billion—$5 billion more than the sum Congress appropriated last year.

In squeezing the service budget requests down to $38 billion, the administration's pre-Sputnik objective, Pentagon budgeteers eliminated new production money for nuclear-powered bombers, chemical bombers—manned planes powered by boron and other "exotic" fuels—for an advanced long-range, fighter-interceptor plane, and for one of the competing Army-Air Force air surveillance and data processing systems for control of planes and missiles over tactical combat areas.

At press-time, the administration was seriously reconsidering these measures. At the same time, it was making basic decisions on whether to order more Boeing B-52 heavy bombers; how far to go with production of Convair's B-58 supersonic medium bomber, still being flight-tested; and how many more nuclear-powered aircraft carriers and submarines to produce.

At issue is the controversial but fundamental question whether further development and production of manned planes should be scrapped in favor of an accelerated missile program; or, if not, at what rate should piloted aircraft procurement be phased out and replaced by new missiles.

With the relaxation of the military budget squeeze, new hardware procurement contracts are starting to flow again. During July-September 1957, the Defense Department virtually froze the award of new business—other than extending essential existing projects.

Now, during October to next June, total value of procurement contracts to be awarded will be about $14 billion—roughly the same amount as during all of fiscal 1957. In fiscal 1959, the value of new contract awards is likely to rise substantially for the first time in two years.

All sorts of proposals are going into the hopper on how to spend more money for defense. The Federal Civil Defense Administration, for instance, has recommended a $34-billion underground shelter construction program. FCDA's budget is apart from the military budget, to be sure, and no one in Washington expects the proposal to get very far.

But the recommendation illustrates the mood of many defense planners who have been held down in the past by the administration's clamp down on expenditures.

100 Missile Subs?

Senator Henry Jackson (D, Wash) calls for production of "at least" 100 missile-armed, atomic-powered submarines. The current Navy program includes construction of only 15—and no more than half will be able to launch ballistic missiles. The upcoming budget will cover production of more A-subs, to be sure, but nothing like the number advanced by Jackson.

The Senator also speaks of higher taxes to pay for the increased defense program.

As volume production of IRBM's gets under way next year—"earlier than had been expected," says Defense Secretary McElroy—the big increase in defense costs will be for ballistic missiles.

Current Defense Dept expenditures for all missile production run at an annual rate of $2.5 billion. General Thomas D White, the Air Force Chief of Staff, says the Air Force alone will spend this much for missiles in fiscal 1959.

Wage Bargaining To Be Tougher in 1958

WASHINGTON — Declining operations in the metalworking industries are being watched for their impact on wage negotiations in steel, auto, aircraft, electrical and other unions next year. The outlook is for much tougher bargaining than in 1957.

In general, this kind of situation makes for a less belligerent attitude on the part of labor leaders when they meet management across the bargaining table. Workers worrying about holding their jobs aren't apt to be so eager to back up leaders who talk strike.

Tougher Bargaining

The outlook for 1958 is for stiffer labor contract negotiations. The peaceful settlements such as in 1957 aren't likely to be the rule when labor comes up for bargaining next time around.

Biggest wage situations next year will come out of Walter Reuther's negotiations with auto companies in mid-1958. He will open his bargaining with a single, long-term goal—to save the income of workers who are no longer needed in industry.

The United Auto Workers will lead the bargaining parade. What happens between the UAW and the auto industry will set the pace for other unions.

The one principle in bargaining for next year—and the future—is that manufacturing industries will need fewer workers and at the same time continue to produce more. The goal will be to ease the economic hurt to the laid-off worker; to increase the cost to industry for cutting the work force.

First demand, with this principle in mind, will be a shorter work-week. This is strictly a spread-the-work program. It can take the form of the four-day week or the six-hour day, or some variation of these.

Second demand will be a hefty pay raise. Reuther has some sizable 1957 increases to serve as a platform for 1958.

Whether Reuther shoots for it or not, other industrial unions such as the International Association of Machinists are going for severance pay. This demand has come up this year and it's natural in industries which are cutting their work forces.

A sure demand is an increase in the supplementary unemployment benefits, now paid for 26 weeks a year. The plan will be to increase payments and the duration to a full 52 weeks a year.

All these demands are geared to the theory of reduction in the industrial working force, both through advancing automation and, in the case of 1958 at least, possible unemployment. The idea is not just insuring income for the unemployed; what the UAW wants to do is to make layoffs so painful to the employer that he'll keep as many employees as possible on the job.

Wage Increases in 1957

The auto workers and other unions have a fairly sizable base to build on—the record of wage increases won by labor during the current year. The average settlement was more than ten cents, some three cents higher than last year. The largest wage increases were won in the construction industry, where settlements averaged around 15-16 cents per hour. Oil workers and rubber workers were not far behind.

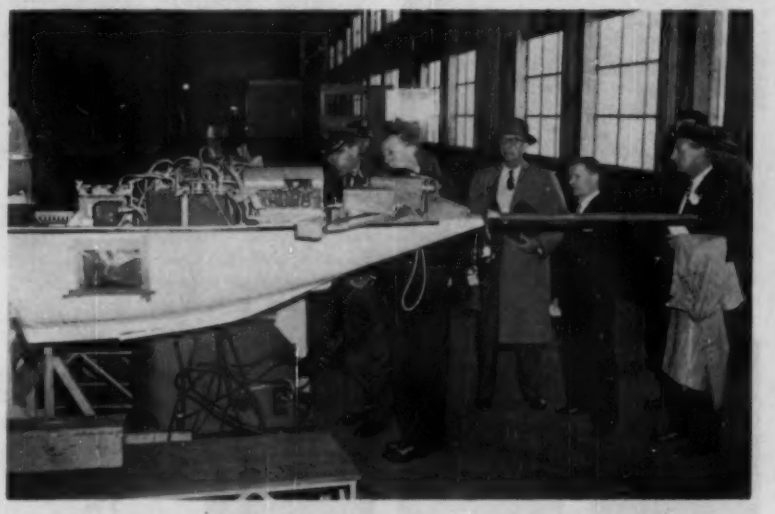
In steel and auto industries, mid-contract adjustments stemming from long-term contracts brought sizable hikes. In both cases contracts provided for automatic pay hikes for productivity and raises for each rise in living costs. When the totals were in, the steelworkers collected 16.1 cents; the auto workers, 15 cents.

Other Benefits

Fringe benefits didn't take a back seat either. Thus in some 40% of all contracts there were upward adjustments in health and welfare benefits. Paid vacations were increased in 30%; pension plans raised in 20%.

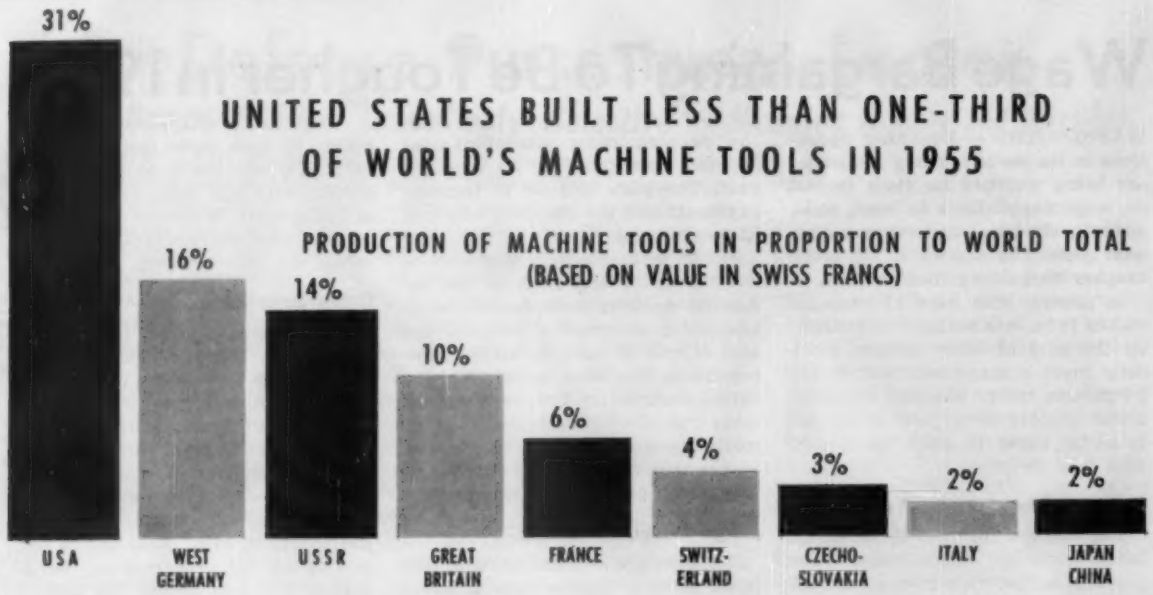
Benefits to laid-off workers—severance pay—were included in 16% of negotiated contracts or double the percentage in 1950. Most unions just getting on the severance-pay bandwagon will aim to get the laid-off worker a week's pay for each year of service up to 15 years. After 20 to 25 years of service, the payment would be larger. Some 55% of severance contracts do not provide a maximum to be paid to an employee and, in most contracts, the payment is made in a lump sum.

To become eligible for severance payments, most contracts require that the worker be laid off because of plant shutdowns, mergers, technological change or lack of work.



American technical mission . . .

inspects a Jindivik, an Australian pilotless target plane, at the Government Aircraft Factory in Melbourne, Australia. The mission, made up of eleven high-ranking officers and a civilian army expert, was in Australia to assess the capacity of Australian industry to manufacture US military equipment. Curtiss-Wright is interested in securing exclusive rights to produce plane in the US. Negotiations have been under way for 7 months



US Still Leads World in Machine Tool Output—But the Gap Is Closing

NEW YORK—The nations of the free world produced three-fourths of the world's machine tools and the Communist world one-fourth in 1955, according to estimates made by the European Committee for the Co-operation of the Machine Tool Industries.

More than that, the U S machine tool industry built close to one-third of all the machine tools produced in the entire world during that year (31% to be exact). All of western Europe turned out 40% of the world output, exceeding the United States by a comfortable margin.

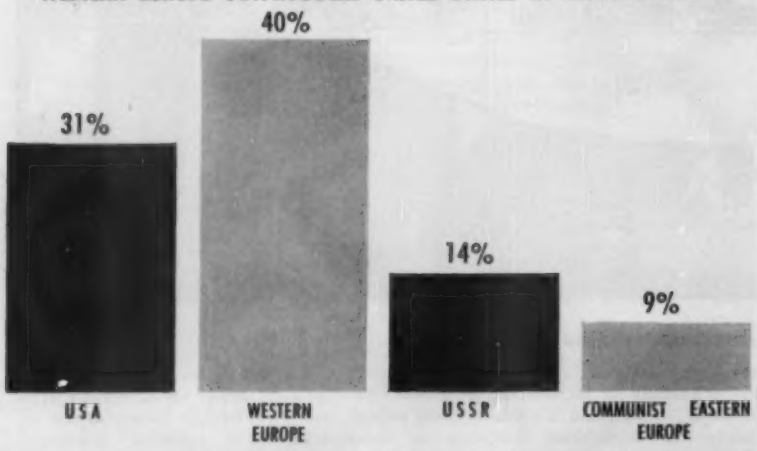
Russia produced 14% of the world total, or less than half the U S production. Russia and her satellites accounted for 23% altogether.

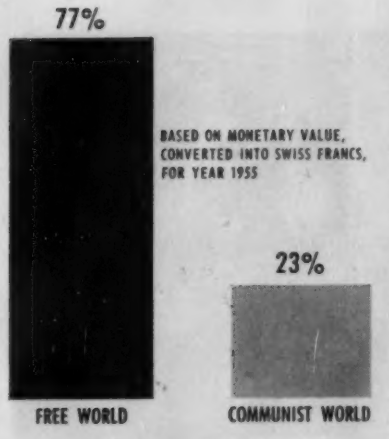
West Germany's performance has been the most spectacular of all. From no production in 1948, her machine tool builders have accomplished the remarkable feat of reconstructing their industry to the point where in 1955 she produced one-sixth of the world's machine tools, being second in size only to the United States. Great Britain's share of total output was 10%.

The calculations of the European Committee were made on the basis of converting the monetary value of shipments of the various nations into Swiss francs as a common denominator. Weight could not be used for comparative purposes, because no weight figures are available from the U S industry.

The European Committee does not claim absolute accuracy for its estimates. It realizes that in the conversion of national currencies into Swiss francs, it may have come up somewhat wide of the mark in its final figures. If allowance is made for differences in physical volume of production that do not show up in mere monetary comparisons, it is reasonable to believe that output by the U S industry is far less than the 31% of the world total and that production by other nations is correspondingly higher. American prices, for one thing, are much higher than those in any other country, thanks to high wage rates and high materials prices.

Russia's share of world production





FREE WORLD PRODUCED THREE-FOURTHS OF MACHINE TOOLS BUILT IN 1955

of machine tools is believed to be much greater today than the 14% indicated for 1955. The Soviet industry has been manufacturing 100,000 machine tools a year, with total weight of 250,000 tons. Russian goal in 1960 is 200,000 machine tools.

Czechoslovakia exports a larger percentage of machine tools than any other nation, the European Committee's figures reveal. The ratio is around 75%. Belgium is a close second. West Germany's exports were just above 40%, Great Britain's closer to 20%. Russia's shipments of machine tools abroad, at 7-8%, were about half the ratio of U S industry's shipments abroad.

European Metalworking Shows Amazing Progress

European metalworking manufacturers have learned to use electronic guiding systems for production in routine work. Optical, punched card, tracer, and line-follower systems are being widely applied for machine control and are typical of the amazing progress in new developments resulting from European manufacturing research. Jack Kleinoder of Volkert Stampings, Inc, and first VP of National Tool and Die Manufacturers' Assn, said, "These newfound abilities give us ample reason to ponder where they are going."

Recently returned from a tour of England, France, Germany and Switzerland, with six other NTDMA members, Mr Kleinoder urges even greater emphasis on metalworking research in the U S, saying, "It would be a pity to have our machine-tool builders think, like our missile developers, that we cannot be surpassed."

During visits to gage and tool firms at Coventry and Hampton, in England, the group found working conditions comparable to those in the U S, except that lighting was notably below our standards. The average wage for skilled labor in these plants was 90 cents to $1.00 per hr.

At plants near Paris the NTDMAers visited subsidiaries of the International Telephone and Telegraph Corp; the General Telephone Manufacturing Co and the L and T Corp. Progress seen elsewhere in Europe had not penetrated to these plants.

From Paris the tourists went to the Hanover Exposition, allowing only five days because, "we expected to find very little worth seeing." They still regret not allowing the full ten days; were "especially impressed by some mass-production machines which surpassed anything in the U S."

Profit Sharing up 1300% In Last Ten Years

NEW YORK—Employees who share in company profits work for decreased costs and thus help to combat inflation. This conclusion was reached by a special panel that participated in the 10th Annual Conference of Profit Sharing Industries held here Nov 14 and 15.

Service industries, for instance, now employ more than half of all workers in America, yet get only slightly more than one third of the consumer dollar; at the same time, they pay out some 56% of the nation's wages and salaries.

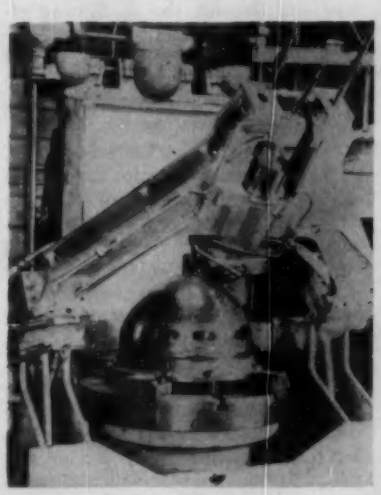
Profit-sharing plans, the panel felt, can combat this low productivity—a major cause of inflation—by raising worker incentive, thus generating more work at a lower cost per unit.

This close relationship between profit sharing and worker incentive was the focal point of the two-day meeting, attended by some 1000 management people representing virtually all industries. Large attendance is indicative of the spurt in interest profit sharing has found during recent years. Current estimates, says the Council of Profit Sharing Industries, place the number of operating profit-sharing companies in the United States at 20,000. Significantly, the council's membership has increased 1300% in the last ten years.

$10-Million Engineering Center To Go Up Near United Nations

Plans for a new United Engineering Center to be erected on UN Plaza in New York City have been announced. Building will serve as headquarters of sixteen national engineering societies with total membership of about 250,000. Expected to be ready for occupancy by the fall of 1960, the 20-story tower surrounded by lower structures with landscaped grounds will replace the present Engineering Societies building, now 50 years old.

Industrial campaign to raise funds is underway, with a $5-million goal. Members of the various engineering societies are expected to contribute another $3 million; this, together with $2 million available in the assets of United Engineering Trustees, Inc, is expected to meet the total cost.



Vertical Spinning Machine . . . spins hemispheres from preheated, circular blanks of 6Al 4V titanium alloy. Unit was designed by Titanium Fabricators Inc, Burbank, Calif, to produce pressure vessels for missile applications at Convair, San Diego. An adaptation of a vertical spinning lathe, machine has a floor-mounted table rotating in the horizontal plane, and a hydraulic yoke which moves up and down on axis of a great circle of the hemisphere. Feeds, speeds and pressure are controllable. Hemispheres are semi-automatically welded, in an inert atmosphere, in specially designed welding unit, and heat treated in a quench chamber. The methods are suitable for long or short runs, and are relatively economical compared with drawing methods, which require expensive dies and tooling

Tracer and Numerical Controls Will Share Limelight in Shop of Future

LOS ANGELES—The well equipped shop of tomorrow will use the end products of the technological evolution of two control systems—tracer and numerical. This opinion was voiced by Carl B Perry, Supervisor, Plant Engineering, Douglas Aircraft Co, Inc, at the Third Annual Contour Machining Conference. Meeting was sponsored by the True-Trace Sales Corp, El Monte, Calif.

Are tracer controlled machines obsolete? Not in the opinion of Mr Perry. He pointed out that one or both of the following conditions must exist before numerical control can be effectively employed—first, there must be great cost difference between producing templets or cams vs. transposing the part description to the numerical intelligence storage medium. Second, the machining efficiency must be substantially improved. In other words the pay-off for numerical control is normally proportional to part complexity, tooling, and machining time.

Tracer control, on the other hand, is best suited to applications in which physical analogs of part geometry (templets or patterns) already exist or may be produced easily and at low cost, and where good machine management can be achieved by an operator. Pay-off here is proportional to part simplicity.

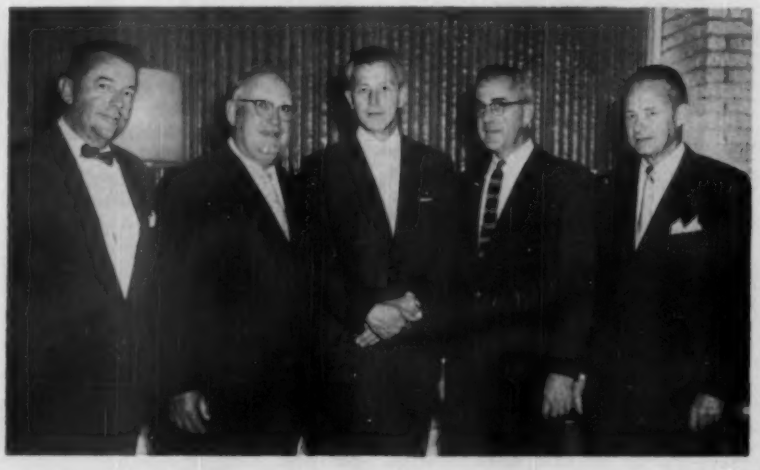
The nature and frequency of information demanded varies sharply with the complexity of the machining task. The operator is a good and adequate source for such intelligence, said Mr Perry, so long as the demands do not exceed the limitations of his nerve-response system. "The generation of unpredictable machine or workpiece responses poses a serious problem for numerical control." Unpredictables exist such as variations in physical properties of materials, and distribution and size of residual stresses in complex forgings. Yet machine control decisions must be made beforehand, and "to do this you must predict the unpredictable or surrender all such parts to the domain of the tracer concept."

He also pointed out the environmental considerations such as capital and programming skill availability, the type and quantity of work, and job or line shop operations influence tracer vs numerical decisions. Considering these factors, Mr Perry sees both systems developing side by side for use in the shop of tomorrow.

"The possibilities of automatic programming are limited only by imagination and economics, according to Douglas T Ross, Head of the Computer Applications Group at MIT's Servomechanisms Laboratory. Discussing the "APT" (Automatically Programmed Tool) system develments at MIT he said that a level had now been reached at which instructions are made in terms of regions of the part.

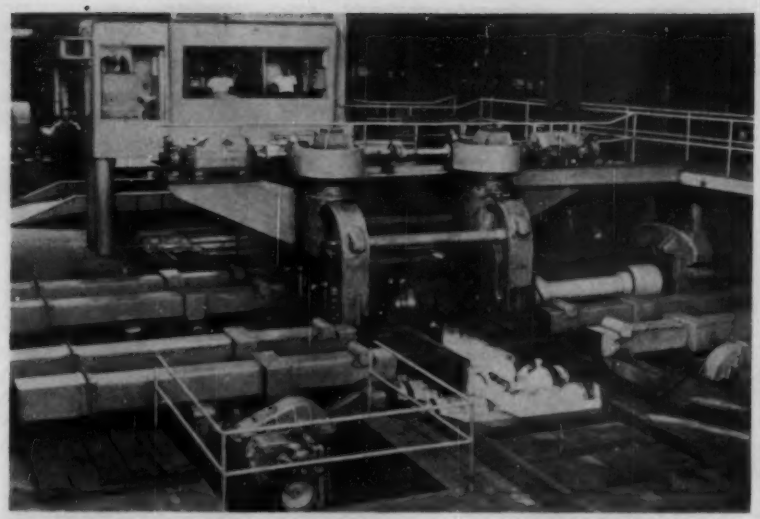
Language design appears to be the most difficult problem but he feels that within 10 yrs or so it may be possible to obtain a part from a system after supplying only a few structural dimensions and the various forces, stresses and vibrations to which the part will be subjected.

Assembly operations . . . at Friden Calculating Machines Co are speeded by the use of adjustable harness boards in place of workbenches. These workbenches were limited to a fixed angle, were space consuming, and made it necessary for the operator to stand 7 hr a day. The new harness boards are mounted on adjustable floor stands and the platform rotates through 360°. The pivot member in the assembly is a work positioner made by Wilton Tool Co



Salute to Industrial Florida

Executives of the newly formed Southeast Machinery Co, organized to meet growing machine tool requirements of Florida's expanding manufacturing industries, were recent hosts at Fort Lauderdale to Gov LeRoy Collins and 200 of the state's leading industrialists and metalworking executives. Representing major machine tool manufacturers throughout the country, the new Florida enterprise will make available a complete, statewide machine tool distribution and service organization. Left to right are E L Eveleth, former engineering and manufacturing executive of United Aircraft, who is vice president and general manager of the new firm; George Habicht, Jr, board chairman of Marshall & Huschart Machinery Co, Chicago, president of Southeast; Gov Collins; Richard W Banfield, president of Motch & Merryweather Machinery Co, Cleveland, and Thomas R Rudel, president and board chairman of Rudel Machinery Co, New York, who are secretary and treasurer, respectively, of the new company



Manipulators (lower left) slide back and forth in conjunction with similar units facing them, aim ingots at correct rolls. Control pulpit is at rear

Latrobe's 32-in. Cogging Mill Rolls Superalloys, Highspeed Steels

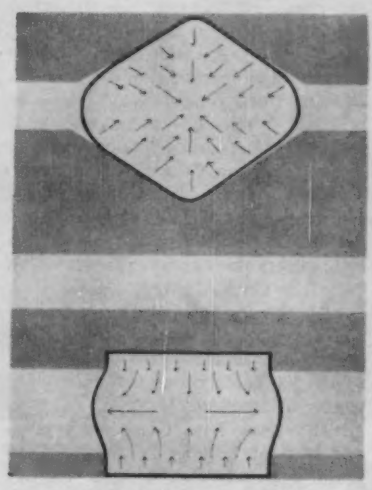
LATROBE, PENNA—Steel industry's first large rolling mill specifically designed for highspeed and superalloy steels, has been developed by Latrobe Steel Co. Process replaces the use of large forges to hammer or press exceedingly hard materials. No ordinary blooming mill has been capable of handling these materials without some damage to metallurgical structure.

Primary feature of the new mill is the use of diamond-grooved rolls instead of the usual box or flat rolls of the conventional blooming mill. Rolling action tends to distribute hot deformation more uniformly, particularly in the center of the ingot. Kneading action reportedly has beneficial effects on internal structure.

Mill will cog ingots as short as 24 in. long from 7 in. square, weighing 300 lbs each, to 18-in.-sq ingots, weighing 4000 lbs each, down to any square billet to 3 in. sq or flat billets to 12 in. wide. All variations of speed of rolling and rate of reduction can be set quickly and accurately from the control pulpit.

Unit consists of a 2-high reversing mill; main rolls are 32-in. dia with a series of diamond grooves. Largest of these will take an 18-in. square and, through series of progressively smaller grooves, plus necessary adjustments of opening between the rolls, any size square can be produced down to 3 in. Adjacent flat section of these rolls allows for production of flat billets to about 12 in. wide. Roll cogging of a square billet requires a sequence of passes through successively smaller diamond grooves. During this operation billet is turned 90° as required between passes until desired reduction in cross section has been accomplished, then is delivered to shear.

Among materials which have been successfully rolled from ingots are all the common highspeed tool steels, such as 18-4-1, M-2, M-3, T-15, including their sulfurized modifications; the high carbon-high chromium die steels (some with as much as 2.5% carbon); and the very high quality, vacuum melted nickel-base superalloys for jet engines and missiles, such as Waspalloy, M-252, and Udimet 500.



Arrows indicate direction of pressure in diamond-shape rolls (top) as contrasted with pressure in conventional box or flat rolls (bottom)

Now, Latrobe is a fully integrated tool steel and super alloys mill. Tool steel volume is now double what it was 10 years ago. Installation of the new mill doubles the company's conversion capacity. Considerably more growth is expected, with large sums slated for investment in other plant improvements, extensions, better equipment, quality control and the like.

Hydraulic System Components Must be Integrated

DETROIT—Aircraft hydraulic system components must be integrated into one balanced unit. This was the main point stressed at the Seventh Annual Aircraft Hydraulics Conference, sponsored by Vickers, Inc, Nov 12 and 13.

This philosophy of systems design was referred to as "optimization." While system design should be of prime importance in hydraulic installations, it is not necessary to develop a new design for each installation, according to E I Brown and S L Sandelman of Vickers. Proper selection of sub-systems will permit their integration into a tailor-made system with only a few components and minimum line connections.

George R Keller, Group Leader, Flight Control Engineering Dept, Autonetics Div of North American Aviation, Inc, pointed out that high temperatures encountered by aircraft flying at increasing Mach numbers tend to reduce the reliability of hydraulic systems. Such a system must be capable of withstanding high temperatures.

Low weight, high power, and reliability, said Frank L Moncher, Director of Engineering, Aero Hydraulics Div, Vickers, Inc, are responsible for the increased use of hydraulic systems in the missile field. In analyzing the three major sources of auxiliary power transmission—electric, hydraulic and pneumatic—it was generally agreed that no one system can be considered best.

FIELD REPORT

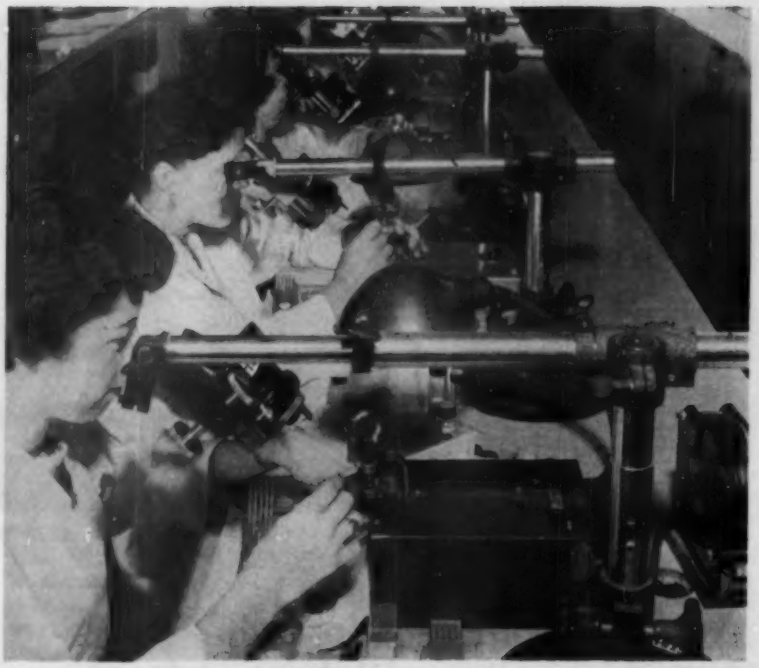
East...

Nuclear Freighter Contract Goes to NY Shipbuilding Corp

Government has awarded a $20.9 million contract to New York Shipbuilding Corp, Camden, NJ, for the first American atomic-powered merchant ship.

Keel of the NS Savannah will be laid next year, and the 21,800-ton ship is scheduled to be in operation in 1960.

Eastern briefs . . .
Westinghouse Electric Corp has two multimillion-dollar contracts from **Boeing Airplane** to manufacture terminal guidance systems for the Air Force IM-99 Bomarc guided missile. They'll be produced at the Baltimore air arm plant in what is reported to be a long-term program . . . **Servomechanisms, Inc,** New York and Los Angeles, received $5.5 million worth of orders in a 30-day period ending Nov 19. New contracts, covering electronic and electromechanical devices for several government agencies and prime aviation contractors, raise company backlog to $15 million total, plus another $11 million under negotiation . . . **American Machine & Foundry Co** has a $2.5 million contract from **Boeing** for launching and handling equipment for the Bomarc missile . . . **New York Shipbuilding Corp,** Camden, NJ, expects to double its work force of 5000 within the next year. Projects now under way, or soon to be started, include six large commercial tankers, three guided-missile destroyers, the super-aircraft carrier Kitty Hawk, a submarine, and conversion of a light cruiser into a guided-missile ship . . . **Daystrom, Inc,** Murray Hill, NJ, has set up the **Daystrom-Weston Industrial Division** at Poughkeepsie, NY. It'll include production of industrial instruments now located at **Daystrom Electric,** Poughkeepsie, and the recorder-controller activities of **Weston Electrical Instrument Corp,** Newark, NJ, subsidiary . . . **Brown & Sharpe Mfg Co,** Providence, has an agreement with **Lipe-Rollway Corp,** Syracuse, NY, to sell the latter's AML bar feed for installation on **B&S** single-spindle automatic and hand screw machines. **B&S** will install, service, and maintain the bar feed together with the screw machines anywhere in the US and Canada . . . **Carpenter Steel Co,** Reading, Penna, has officially taken over the bankrupt **Northeastern Steel Corp,** largest electric furnace steel mill in New England. The Bridgeport concern becomes a subsidiary known as **Carpenter Steel of New England, Inc.** Acquisition of additional facilities are expected to result in combined annual production capacity of 170,600 ingot-tons, approximately double **Carpenter's** former capacity . . . **Barden Corp** plans to put up a $2 million precision instrument ball bearing plant on a 26-acre site in Danbury, Conn. Company expects to move into the new 125,000-sq-ft facility next June . . . **Raytheon Manufacturing Co,** Waltham, Mass, has two orders in excess of $4 million from the **CAA.** Contracts cover four new long-range radar units and amplifying equipment for them. **Raytheon** also plans to construct a $1,750,000 research and development center at Bedford, Mass, for its Missile Systems Div. Company's present staff of 1900 is expected to expand with addition of new facility to about 2500 in the next two years . . . New electronic concern, **Digital Equipment Corp,** has been formed in Maynard, Mass, to provide testing equipment for the computer industry. Organizers are former staff members of MIT's Lincoln Laboratory . . . **Pratt & Whitney Aircraft** has filed an application for a building permit in East Hartford, Conn, for construction of another large addition to its Wilgoos Turbine Laboratory.



Lady Welders—Believe It or Not!
Lady welders at Hughes Aircraft Co, Los Angeles, at work welding together components of semiconductors (the miniature components that replace conventional vacuum tubes in electronic circuits), which are so small that the operation must be done under high magnification

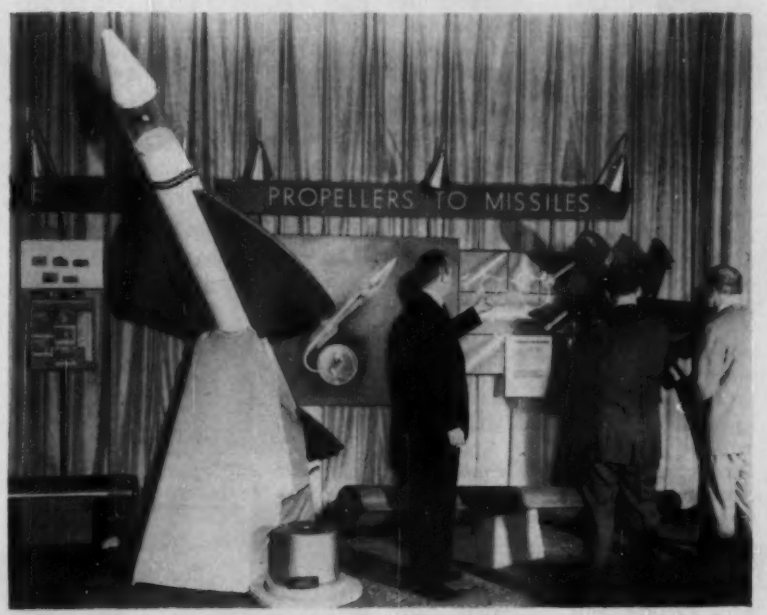
South...

General Dynamics' Convair Div at Fort Worth has a $12.5 million AF contract for procurement of long lead items for additional production of B-58's. Initial order for 30 of the supersonic bombers was for exhaustive testing . . . **Lockheed Aircraft's Georgia Div** at Marietta has a $35-million order from the Royal Australian Air Force for twelve C-130 Hercules prop-jet transports. Incidentally, Lockheed plans to merge its Dunedin, Fla, engineering office with the Georgia Div, says it's because of cutback in AF orders . . . New firm, **Alabama Metallurgical Corp,** has begun construction of a $7-million plant at Selma . . . **Minneapolis-Honeywell's** new $4.5-million facility at St Petersburg has begun

operations . . . **General Electric's** new plant at Murfreesboro, Tenn, has started limited production of small appliance motors; plans call for employment of 400 by end of next year . . . **Airtronics International Corp** has begun operations in Miami. New firm, which purchased the **Holt Industries'** electronic plant, will design and manufacture precision gears, plastic injection moldings, die castings, screw machine products, and metal stampings . . . **Florence Stove Co's** plant at Lewisburg, Tenn, has been sold to the **Quaker Manufacturing Co,** a division of **Heil-Quaker,** new company jointly owned by **Heil Co** of Milwaukee and **Sears, Roebuck.** Lewisburg plant will be used for manufacture of space heaters and central heating and air conditioning equipment . . . **Proctor Electric Co,** Philadelphia, has started production of electric toasters in its $1.5-million Mount Airy, NC, plant . . . **American Cast Iron Pipe Co,** Birmingham, Ala, is building a $1-million facility to house its steel casting operation; it'll be completed early next summer . . . **Benjamin F Shaw Co** of Wilmington, Del, is putting up a plant at Tuscaloosa for production of fabricated assemblies of carbon steel and alloys . . . **Central Screw Co's** new 80,000 sq-ft unit in Frankfort, Ky is now in operation . . . **Trane Co's** new $1.5 million plant at Clarksville, Tenn, will be ready for occupancy by Feb 1. The 150,000 sq-ft manufacturing facility will turn out central residential air conditioning units . . . **Croft Aluminum Co,** McComb, Miss, will add some $750,000 worth of new equipment during its current expansion program . . . **Mead Corp,** Dayton, has bought a 24-acre industrial site in Atlanta.

Midwest...

Taylor-Winfield Corp, Warren, Ohio, welder manufacturer, has bought out the metalforming and workhandling machinery lines formerly built by **Struthers-Wells Corp** of Titusville, Penna. **T-W** will now be able to design and build coordinated production lines to process coil or strip through to the finished product . . . **Westinghouse Electric's Aviation Gas Turbine Div** at Kansas City has a Navy production contract in excess of $17 million for jet aircraft engines . . . Acquisition of **Gardner-Denver Co** of Quincy, Ill, by **Dresser Industries** of Dallas, Texas, adds up to combined sales volume of $350 million a year, total assets of about $250 million. **Gardner-Denver,** producer of compressors, pumps, rock drills, and air tools, will be combined with four present **Dresser** subsidiaries, forming the **Gardner-Dresser Co,** headquartered at Quincy . . . **Chrysler's** new assembly plant, covering 1.3 million sq ft on a 200-acre site in the St Louis area, is scheduled for completion in the spring of 1959. First output will be 1960 Plymouths; building capacity will be 960 cars a day . . . One reason for Detroit's **Snyder Tool & Engineering Co's** recent expansion was to provide more high-bay floor space area for assembly of automated machinery which, company reports, is becoming longer and longer as trend continues toward completely automated production lines . . . **Roper Hydraulics, Inc,** new Illinois corporation, has taken over the business of the **Geo D Roper Corp's Pump Div.** Separation program, started eight years ago, keeps intact the company's pump operations and its household appliance activities . . . **G S Blakeslee & Co,** Chicago builder of automatic industrial washers and degreasing machines, has joined forces with **Branson Ultrasonic Corp** of Stamford, Conn, to design, sell, and service a line of ultrasonic cleaning machines. **Blakeslee** is incorporating **Branson's** Sonogen generators and transducers; ultrasonic washers and degreasers using Branson equipment will be available through Blakeslee . . . **Dalic Metachemical Ltd,** Toronto, has opened two new US offices—**Ohio Metachemical Inc,** Cuyahoga Falls, Ohio, serving the Midwest, and **Piddington & Associates Ltd,** Pasadena, Calif, the Far West. The two firms, together with **Marlane Development Co,** New York, and company's main office in Toronto, can now supply Dalic selective area plating equipment and materials for any plant throughout the US . . . **Mercast Corp** has acquired **Gray & Huleguard, Inc,** Los Angeles supplier of electric motors and hydraulic servo-units for missiles, jet aircraft, and electronic devices. Company will be operated as a third subsidiary; other two are **Alloy Precision Castings Co** of Cleveland and **Mercast Manufacturing** of La-Verne, Calif . . . **Jefferson Electric Co,** Chicago manufacturer of electrical components, has entered the guided missile field through acquisition of **Electronic Products Corp** of



Extruded missile body . . .
adapted from extrusion technique developed for propeller blades was proposed by Curtiss-Wright Corp at display by its Metal Processing Div. Included in display of extruded products was 90-mm gun tube, production of which was described in *AM*—Nov 18 '57, p158. Demonstrations ranged from jet-engine blades to a 46-ft tube, 16-in. OD, extruded from chrome moly steel on the 12,000-ton press in the division's Buffalo plant

FIELD REPORT

Santa Barbara, Calif. Assets of the company, which makes custom cables and electronic assemblies for the guided missile industry, have been purchased by a new corporation set up by **Jefferson** as a subsidiary. New firm will be known as **Jefferson Electronic Products Corp** . . . Neosho, Mo, plant of **Rocketdyne**, a **North American Aviation** division, is starting production of engines for the Atlas ICBM. Slated to become a prime source for missile propulsion systems during the next year, the recently occupied plant has been in build-up production of the developmental engine and components since Feb. **Rocketdyne** employs more than 10,000 workers in its Calif and Mo operations; Neosho plant's current payroll is 625, expects to reach 900 by July.

West . . .

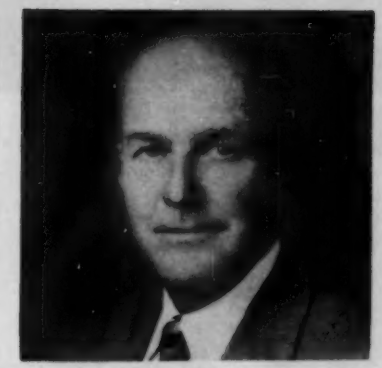
Employment at **Ryan Aeronautical's** Torrance, Calif, plant it expected to hit the 1700 mark by early 1959. Present work force of 400 will reach 1000 by next summer. **Ryan** is doubling the size of the plant with erection of three new buildings totaling 140,000 sq ft. They'll provide more space for production of Firebee missiles and for work on Douglas DC-8 Jetliner jet engine power packages and pylon assemblies . . . California steel production is growing faster than in the rest of the nation. American Iron & Steel Institute Executive Vice President Max D Howell told delegates to a recent regional meeting of the Institute that state production has increased 280% since 1940, while in the nation as a whole it has risen 72% . . . **General Electric** will move its Oakland, Calif, plant, which designs and manufactures electrical motor control equipment, to nearby San Leandro. The 30,000 sq-ft facility, built for expansion, will be in operation by April . . . Production of brass products has been started by **Titan Manufacturing Co** at its new $3-million plant located on a 40-acre site at Newark, Calif. All product departments are expected to be in operation by mid-December. Facility will ultimately turn out 25,000,000 lbs of brass and bronze products annually, including extruded free-cutting brass rod from 1/16 to 2 ½-in. dia, extruded brass shapes, forging rod, and unmachined brass and aluminum forgings . . . **Kaiser Steel Corp** is building a $2-million addition to its fabricating division plant at Napa, Calif. It'll double capacity, making it one of the largest plants in the world for fabrication of line pipe for petroleum and gas transmission. Facility makes electric weld pipe up to 20-in. dia and expanded fusion weld pipe up to 36 in.; new equipment will boost capabilities to 42 in. . . . **Dalmo Victor Co,** Belmont, Calif, division of **Textron, Inc,** has set up a new Hydraulics Div. It'll engineer, manufacture, and sell electro-hydraulic servo valves, rotary and linear actuators, pumps, and hydraulic tuners . . . **Siegler Corp's Olympic Radio & Television Div** has a $1,306,000 contract from the Bureau of Ships for production of ultra-high frequency radio direction finding equipment for the Navy . . . **International Glass Corp,** Culver City, has changed its name to **Monogram Precision Industries, Inc,** feels new name better fits its present diversity. Company recently acquired **Cascade Research Corp,** in which it will combine all its electronic activities. Other divisions are **Monogram Manufacturing** (precision sheet metal fabrication and industrial clamps) and **International Glass** (optics) . . . **Temco Aircraft,** Dallas, has a contract in excess of $25 million for production of 58-ft aft fuselage sections for an improved version of Boeing's B-52 Stratofortress . . . **Aeronutronic Systems, Inc,** new west coast subsidiary of **Ford Motor Co,** has acquired a 200-acre site near Newport Beach, Calif. Plans call for establishment of a $10-million research, development, and prototype center over a period of years, occupying more than 500,000 sq ft of floor space. First unit, a series of aerothermochemical labs, will be completed by April. Aeronutronic was organized last year to develop and manufacture systems and products for military and commercial use. Military production includes missile weapon systems, anti-missile systems, and upper atmosphere vehicles . . . **North American Aviation's Autonetics Div** has a new contract from the Bureau of Aeronautics for pilot line procurement of an advanced airborne magnetic tape recorder planned for use in several all-weather Navy interceptors . . . **Carrier Corp** has opened its new $6.5-million plant near La Puente, Calif. The Day & Night and Payne Divisions will move from Monrovia to the new 500,000 sq-ft facility.

Clinton E Smith, assistant to the general sales manager of Pratt & Whitney Co, has been elected president of the Solid Carbide Institute, national organization headquartered in New York

G T Willey, vice president, manufacturing, of the Martin Co, Baltimore, has been assigned additional duties as vice president and general manager of a new division formed to expedite arrangements for launching both the Navy Vanguard earth satellite and the AF Titan ICBM. Mr Willey will have charge of all Martin activities in the Patrick Air Force Base and Cape Canaveral area, including continued testing of latest versions of the AF Matador tactical missile.

Richard H DeMott has resigned as board chairman of SKF Industries, Philadelphia, to become vice president and special assistant to the president of H B Maynard & Co, management consultants headquartered in Pittsburgh. Mr DeMott's principal duties will be in connection with the New York, Boston, and Pittsburgh divisions of the firm which has seven US offices and five in Europe.

Albert C Wedge, production superintendent of DeWalt Inc, subsidiary of American Machine & Foundry Co, has been elected vice president, manufacturing



T Laurence Strimple (left), secretary and general counsel of National Acme Co, has been elected president of the company. He succeeds **Frederic H Chapin** (center), who has resigned as president but will continue to serve as board chairman. **Charlie W Simpson** (right), executive vice president and director, has requested to be relieved of active duties; he will continue on a consulting basis after year's end (*AM*—Nov 18 '57, p187)

NAMES IN THE NEWS...

P F Bauer, managing director of Allis-Chalmers International, has been named a vice president of the company. Also named vice presidents are **E J Mercer,** general manager, Construction Machinery Division; and **William M Wallace,** general manager, General Products Division.

Elmer A Widerborg has been named manager of the newly formed Tool and Manufacturing Division of A O Smith Corp, Milwaukee. Tooling operations were previously part of general plant service activities, headed by Mr Widerborg.

Harold J Bergum has joined Nylok-Detroit Corp as plant manager in charge of the company's new manufacturing facilities at Troy, Mich. He has been associated with Ford Motor Co's engineering department for the past 12 years.

Harry T Jeter has been appointed vice president, manufacturing, of Longren Aircraft Co, Torrance, Calif. He was formerly production manager.

V L Bradford, executive vice president of the Milford Rivet & Machine Co, Milford, Conn, has been elected president of the organization to succeed **F H Merwin,** named chairman of the board.

George J Parker has been named general manager of Norden-Ketay's Florida Gear Division in Miami, producer of precision gears and gear assemblies for missile and aircraft instrument application. Mr Parker was formerly vice president of Daystrom, Inc. **Jay R Gill,** who has been acting as general manager, will continue as sales manager of the division.

Don W Branning has been appointed manager of Sundstrand Machine Tool Co's American Broach and Machine Division, Ann Arbor, Mich. He formerly headed the Detroit sales office

Harold F Falk, executive vice president of the Falk Corp, Milwaukee, has succeeded his father, the late **Harold S Falk** as president. **Matthew A Carpenter,** chairman of the executive committee, has been made board chairman

John Lawrence, formerly president of Joy Manufacturing Co, has joined Dresser Industries, Inc, Dallas, Texas, as vice president.

E F Mitchell has been appointed vice president and general manager of the Vitrified Wheel Co, Westfield, Mass

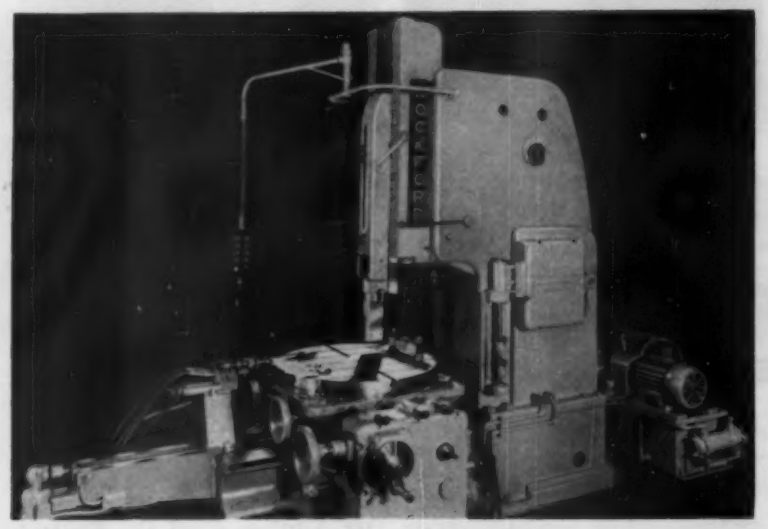
Robert Cushman, assistant sales manager of grinding wheels for Norton Co, has been named to the new post of manager of marketing services. **W Alexander McCune, Jr,** formerly general sales manager of the Norton Co of Canada, Ltd, Hamilton, Ont, has been made new manager of field sales. Both appointments are in the company's Abrasive Division.

Ray W Heiden, an executive of Progressive Welder Sales Co, Pontiac, Mich, for over 21 years, has been elected president and general manager of all plants and operations. He succeeds the late **Fred H Johnson,** founder of the company. **Harry S Rose,** formerly in charge of Detroit area sales, has been appointed vice president, national sales manager, and acting head of the Special Machine Division.

OBITUARY

William K Stamets, founder and president of the William K Stamets Co, Pittsburgh, died Nov 17. He was one of the nation's outstanding and best known machine tool distributors, and a past president of the American Machine Tool Distributors' Association. Mr Stamets also was president of the Enterprise Co, Columbiana, Ohio, builder of heavy machine tools and pipe-handling equipment.

NEW SHOP EQUIPMENT



Rockford 20-in. Hydraulic Slotter Offers Both Tracing and Slotting

The new 20-in. hydraulic slotter is capable of both conventional slotting and complicated tracing work, with quick changeover between these operations. A transverse movement of the slotter table makes rotary or straight work possible. Equipped with the highly sensitive Kopy-Kat duplicator, this new slotter will produce its own working templets from a toolroom master or from a finished workpiece.

In addition to the hydraulic fulcrum drive to the ram, the machine has pendant-controlled cutting speed changes; hydraulic feeds and power rapid traverse in all directions; dividing head; and stroke length adjustment while the ram is in motion.

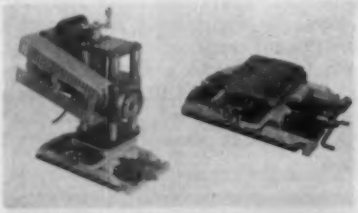
Rockford Machine Tool Co, Dept 201, Rockford, Ill

Hard-Facing Alloy Combines High Hardness, Machinability

Colmonoy No. 56, a nickel-base alloy containing chromium borides, provides protective hardness in the range of 50 to 55 R_c yet is machinable with carbide tools.

Product melts at approx 1925 F and is said to have an unusually low coefficient of friction which is retained as wear occurs. Additional features claimed are excellent abrasion, corrosion, and galling resistance, as well as red hardness and weldability; impact resistance is rated as very good.

Wall Colmonoy Corp, 19345 John R St, Detroit 3, Mich

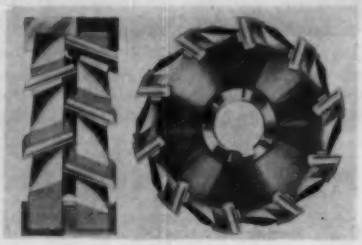


Dumore Feed Table Adds to Versatility of Company's Versa-Mil

Feed table has been developed to increase the versatility of company's Versa-Mil unit, as well as to provide additional adjustments on standard machines and precision feeds and slides for jig or fixture setups. Four sizes are available with longitudinal feeds varying from 8½ in. on the smallest to 42½ in. on the largest. Cross feed on all is 3⅜ in.; leadscrew is calibrated to 0.001 in.

A connecting hand lever provides manual feed. Hydraulic, pneumatic cylinder or electrically powered unit is readily added to provide automatic feed. When it is necessary to machine close to the surface on which the table is mounted, the lower carriage may be removed to reduce the height from 3 5/16 to 1 11/16 in., in which case only one direction of travel is available.

Dumore Co, 1300 17th St, Racine, Wis



Channeling Cutters are Designed To Cut Light Metal Alloys

Inserted-blade interlocking side milling cutters are designed for channeling of aluminum and magnesium alloys. They are easily expanded to meet slotting width variations. Design permits shimming between the two sections to maintain width without resetting blades. Total adjustment available is 3/16 to 5/16 in., depending on the width of the cutter body.

Cutters are coarse pitch with ample chip room. Chip spaces are polished to facilitate chip disposal. Diameters range from 5 to 16 in. Other sizes available on request.

Goddard & Goddard Co, 12280 Burt Rd, Detroit 23, Mich

Titanium and Titanium Alloys Available in Foil Gage Thickness

Commercially pure titanium and some titanium alloys, rolled to foil gage and annealed, are now being turned out in experimental and production quantities. Types available include all types of commercially pure titanium rolled to a minimum thickness of 0.001 in.; Beta alloys, type B-120 VCA, rolled to 0.002 in. minimum; Alpha-Beta alloys, 6AL-4V and others, to minimum thicknesses (depending on the alloy) of 0.003 in. to 0.001 in. All can be annealed. It is believed that this is the first time that these titanium alloys have been successfully processed into foil thicknesses.

Metals and Controls Corp, General Plate Div, Attleboro, Mass

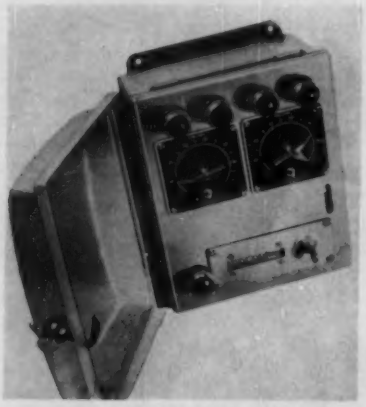
MATERIALS AND PARTS

Solid-Carbide Insert Offers Ten Cutting Edges, 30° Lead Angle

Pentagon insert has ten cutting edges and offers a 30° lead angle which reduces shock to the tool nose. By reducing the end cutting edge angle to 12° a greater volume of carbide backs up the cutting edge.

The new toolholder, designated Wil-Dex, has a positive lock clamp for the insert and chipbreaker. Spring tension on the clamp bolt facilitates indexing by lifting the clamp when the clamp bolt is loosened. Catalog and price list available.

Willey's Carbide Tool Co, 1340 W Vernor Hwy, Detroit 1, Mich



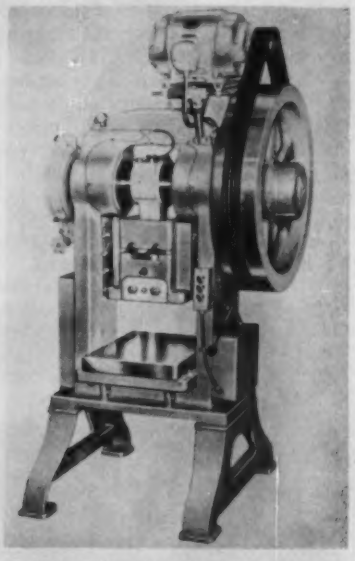
Counter Units Control Tool-Change Periods, Extend Tool Life

New Toolitrol counter units designed for installation as an accessory on single- or multi-spindle machines take the human element out of resharpening procedures and permit major cost reductions by controlling tool-change periods and extending tool life.

These counters provide a visible signal when a tool change is required. The units are preset to the number of parts to be produced before the tool is to be changed. Six basic models are available, having from 1 to 6 switches. In addition, 15-count switch ranges can be provided. The available ranges begin with 0-72, and go as high as 0-54,000.

When tool reaches 80% (or other figure that can be adjusted at the factory) of the number of cycles permitted, an amber light flashes on to warn operator that a tool change is coming up shortly. When reset knob reaches zero, both the green "on" light and the amber light go off and a red light is turned on, indicating need for tool change. If desired, a relay can be provided that will stop machine at this point.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill



Straight-Side Flywheel Press Blanks, Forms, and Embosses

The No. 8 Model I straight-side flywheel press is the latest addition to company's line of industrial presses. It has a solid frame and a capacity of 80 tons. Made to customer's specifications, press is available both plain and geared and with air clutches.

Machine, equipped with bronze-bushed main and pitman bearings and a roller bearing flywheel, can be used for a wide variety of work including blanking, forming and embossing.

Perkins Machine Co, Warren, Mass

including...

MACHINE TOOLS AND ATTACHMENTS

Lathes 150
Radial Drill 151
Boring Machine 154
Heavy-Duty Shaper 160

TOOLS AND ACCESSORIES

Saber Saw 150
Round Broaches 150
Toolholder 152
Solid-Carbide Tools 154
Countersink Gage 156
Positioning Table 158
Relief Grinding Attachment 160
Marking Machine 162

FORMING AND FORGING

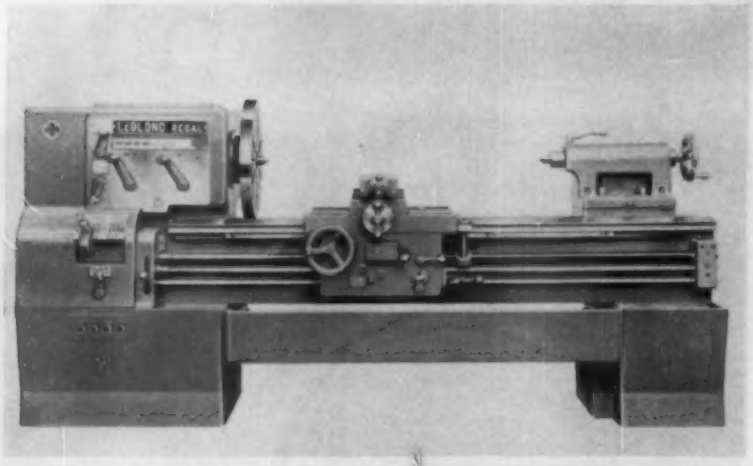
Shear 152
Molding Press 154
Air-Hydraulic Press 158
Tube Bender 162

WELDING AND HEAT-TREATING

Adjustable Torch Head 150
Electrode Wire 178

PLANT SERVICE EQUIPMENT

Lift Truck Boom Attachment 154
Pre-Fab Conveyors 160
Hydraulic Lift Table 160
Flat-Top Truck 164

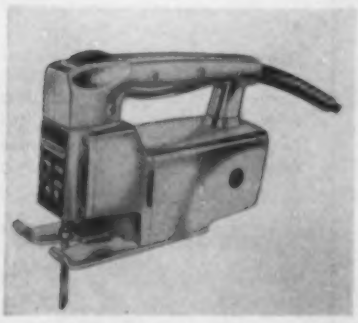


LeBlond Lathes Provide Heavy-Duty Features at Economy Prices

Latest additions to company's Regal line, these 21 and 24-in. Regal lathes give capacity, speeds, and horsepower usually found only in heavier-type machines. Both models can be obtained with standard 7½-hp drive, and optional 10 hp for high speed ranges; electric clutch and brake; feed reverse at the apron; heat-treated gears in the head; quick-change box and apron—in addition to many other LeBlond features including gear-belt drive construction.

Bed has hardened and ground replaceable steel ways, fitted according to the compensating V-way principle to insure better force distribution. General dimensions and construction details are patterned after company's heavy-duty engine lathes.

R K LeBlond Machine Tool Co, Cincinnati 8, Ohio

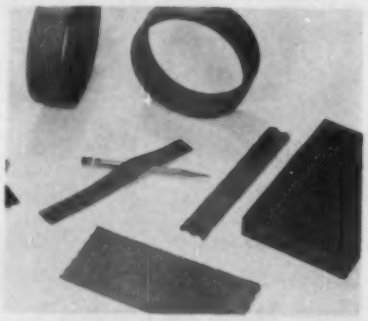


Stanley Heavy-Duty Saber Saw Cuts Wood, Metal and Plastic

Model H75 saber saw can cut through a full 2 in. of lumber and cuts wood, metal, plastic and veneers, composition board, rubber and leather. A single screw secures the blade and holds its rigid. By moving the base back and using the special shear cutting blade, the user can cut right up to a wall.

Vibration is reduced to a minimum and a chip blower keeps guide lines clear. Saw retails for $54.50, including three assorted blades and ripping guide. It is also available in a kit with eight different blades, ripping guide and a metal case.

Stanley Electric Tools, Div of Stanley Works, New Britain, Conn



Cemented Carbide Material Speeds Hard Surfacing of Metal Surfaces

New material called Kenplate is an adaptation of company's cemented tungsten carbide. It consists of small hexagonal plates of cemented tungsten carbide assembled in a continuous pattern on an adhesive glass-fiber backing to provide flexible sheets or strips for application on flat or curved surfaces. The backing holds the plates in position while they are being bonded by epoxy adhesives, silver solder, or conventional brazing materials to provide continuous surfaces that utilize the wear-resistant properties of hard tungsten carbide.

Hexagons are made in two sizes, 0.425 and 0.210 in. across flats. Each size is available in three thicknesses. The smaller plate comes in thicknesses of 0.040, 1/16 and ⅛ in.; the larger, in thicknesses of 1/16, ⅛ and ¼ in. After application, normal joint spaces are said to be less than 0.002 or 0.003 in.

Kennametal Inc, Latrobe, Penna

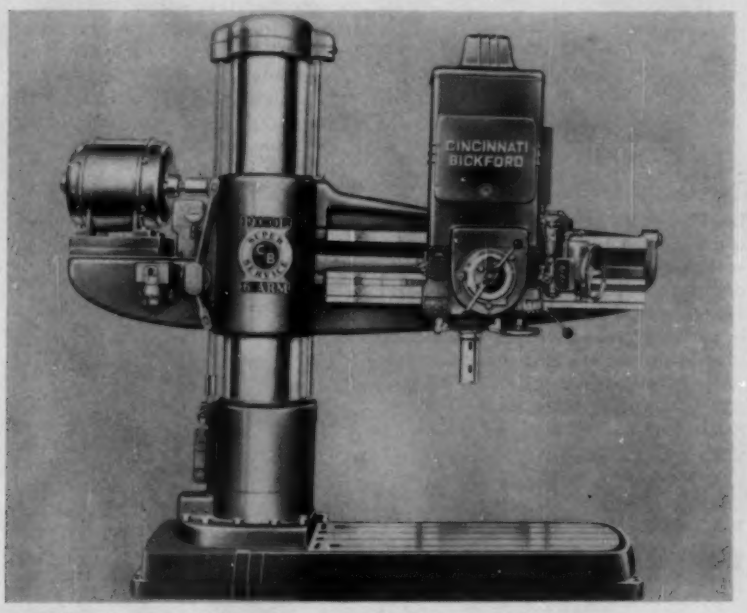
ROUND BROACHES can be used with hydraulic presses or shop arbor presses. These push-type broaches, which eliminate chatter marks, rings and run-out, are available as stock items in 13 sizes. Catalog available—*DuMont Corp, Greenfield, Mass*

Adjustable Angular Torch Head Can be Set While on Torch

The new angular machine-torch adapter is adjustable through the extremely wide range of 250°. The cutting head can be set without tools, and without removing the accessory from the torch. Any required angle can be set between 0 and 90° either side of vertical, and within an additional 35° above horizontal. Both sides of body bear indexing marks in increments of 5°.

Device accommodates standard Airco acetylene, propane, and natural-gas tips, and is designed for service with the Airco Style 4700 machine cutting torch. In addition to vertical and horizontal cutting, the adapter will find use in such applications as bevel cutting, H- and I-beam work, flanging, and all types of structural shape cutting.

Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42 St, New York 17, NY



Radial Drilling Machines Offer Three Optional Head Designs

Super Service radial drilling machines are now available with three newly-designed heads. The three optional head designs, with centralized operating controls, include: Standard Lever-Shift model with 36 manually controlled spindle speeds and 18 manual power feeds; Partial Pre-Select model featuring hydraulic control of all 36 spindle speeds and manual control of 18 power feeds; and Complete Pre-Select model with full hydraulic control of the 36 spindle speeds and 18 power feeds.

A de-clutchable herringbone driving gear provides necessary power for driving large drills and heavy cutting tools. This gear is de-clutched when using small, high-speed drills.

Machines are available with 13, 15, 17, and 19-in.-dia columns; 4, 5, 6, 7, and 8-ft arm lengths; 36 spindle speeds up to 2300 rpm; 18 power feeds from 0.004 to 0.125 in. with 6 positive geared tap leads.

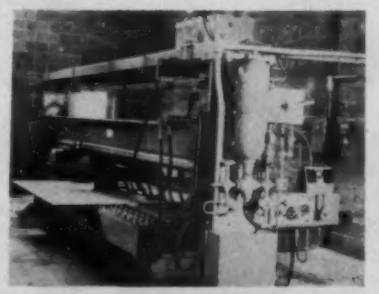
Giddings & Lewis Machine Tool Co, Cincinnati Bickford Div, Cincinnati, Ohio

Cold Heading Die Steel Provides Increased Wear Resistance

Cold heading die steel, tradenamed Hedervan, is a water-hardening type of tool steel developed for critical applications such as cold heading dies, cold striking dies, embossing dies, coining dies, punches and draw dies. It is essentially a 0.90% carbon tool steel containing vanadium additives which impart improved wear resisting qualities to the hardened tools.

Material hardens with a case-core relationship (except in small section sizes) and can be handled in heat treatment in exactly the same manner as carbon tool steel. Material is available in round from ¾ to 4 in.

Latrobe Steel Co, Latrobe, Penna



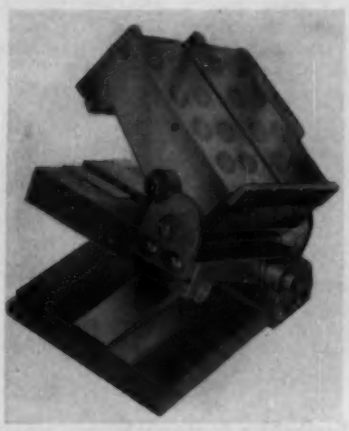
Traverse-Type Cutting Machine Offers High Capacity

Model T-20 hydraulically operated traverse-type cutting machine is reported to be virtually unlimited in its cutting capacity. The cutting head may be operated laterally at any speed from 0 to 50 fpm and raised or lowered 0 to 10 fpm. Machine is equipped with a work stop gage at right angles to the kerf and powerful hydraulically controlled clamping feet for positive hold down of stock.

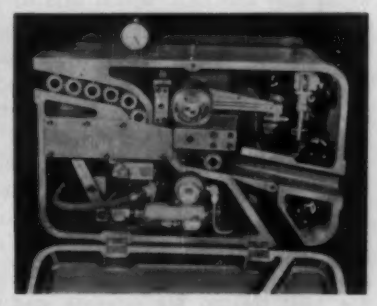
Powered by a 20-hp, geared-in-head, TEFC motor, the machine features stainless steel sealed roller ways for long, continuous, accurate cutting. The unit illustrated is set up to cut stainless steel at approx 3 fpm.

Wheel dia is 20 in. and arbor speed is 2360 rpm, with larger wheels and higher speeds available. Machine is 21 x 8 x 8 ft, has a 12-ft length of cut and a 24-in. vertical adjustment of cutting head.

Stone Machinery Co, Inc, Manlius, NY



SINE PLATES, both single and compound-angle hinged types, are now available with dual-field permanent magnetic chucks that allow each side to be magnetized or demagnetized independently. Central T-slot between the chucks can be used to hold an another guide to help position small pieces—*Bald Eagle Corp, 356 Cedar St, St Paul 1, Minn*



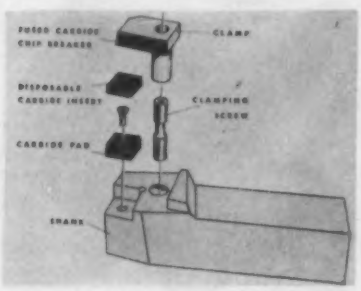
Checking Unit Inspects Helical Or Spur Gears for Concentricity

Automatic gear monitoring unit provides 100% inspection of helical or spur gears for concentricity. Unit

uses conjugate rolling action in two directions of rotation with a master gear in mesh with a part to determine and monitor the amount of eccentricity in the part. After checking, parts within predetermined tolerances are automatically passed to the next operation; parts that are eccentric are shunted from the system. Machine is desgined for integration into automated lines.

Total time for the full checking cycle is 6 sec. Accuracy adjustment is infinitely sensitive to eccentricity errors. Initially designed for short planetary gears of automatic transmissions, unit is available in a range of sizes to suit not only automotive gears but other production applications of larger and smaller gears. All electrical circuits are to JIC standards.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich



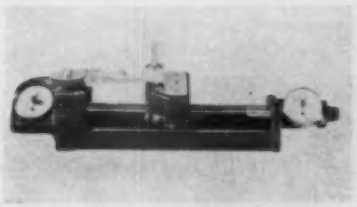
Toolholder Features Fused-Carbide One-Piece Chipbreaker-Clamp

New line of Carboloy toolholders, called Lift-O-Matic, features a one-piece chipbreaker-clamp that functions automatically. Other features include a clamp screw accessible from top or bottom and a clamp color coding for quick identification.

Clamp and chipbreaker are combined into one unit, which lifts or lowers automatically as the clamp screw is turned. Indexing is faster, and easier from any position because the clamp screw is accessible from top or bottom of holder.

The chipbreaker-clamp has a carbide coat fused right to the chipbreaker surface to eliminate braze failure. Each clamp is color coded—yellow for light cuts, silver for medium, red for heavy cuts—to prevent confusion in the shop. Holder shanks are heat treated for strength and long service, and are made to standard lengths. Both toolholder style and insert size are stamped on the shank.

General Electric Co, Metallurgical Products Dept, Detroit 32, Mich



GAGE checks gears for runout, circular pitch spacing, tooth thickness variation, profile error, lateral runout and pin measurement. It can also be used to check shafts for roundness, internal ring groove depths, bores and blind recesses. Indicator shows amount oversize or undersize. Gage weighs 25 lb—*Bedford Gear and Machine Products, Inc, 550 Krick Rd, Bedford, Ohio*

Pushbutton Weld-Cycle Control Simplifies Machine Heliwelding

Weld-cycle control unit provides programmed control of all functions of machine Heliwelding. System is for use with high-frequency current and dc straight-polarity welding power from a saturable-reactor-controlled rectifier-type source, and is designed for applications requiring precise weld timing and crater filling on repetitive circumferential or longitudinal welds.

Timing mechanisms are set in advance. Each operation of the weld start switch initiates the entire weld program, which automatically progresses until weld is completed and crater filled. Weld time may be set for any duration within the range of from 1 sec to 2 min; other ranges up to 20 min are available. Separate timers determine crater fill duration (adjustable from 0.1 to 5.0 sec) and slope control.

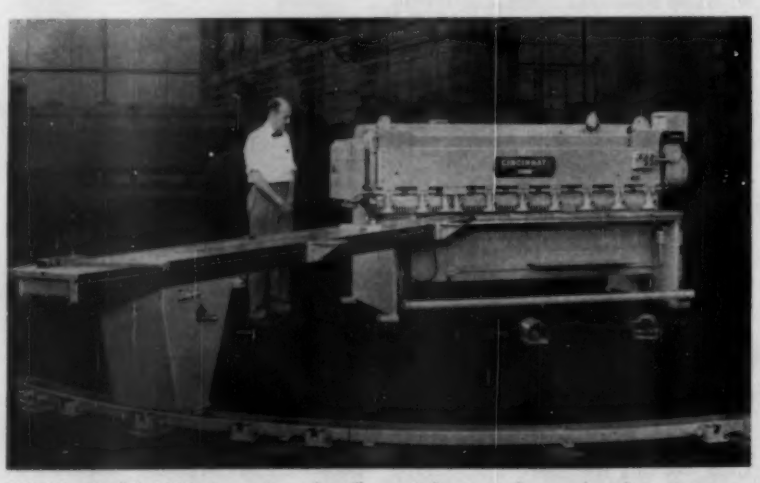
Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42 St, New York 17, NY

Automatic Drilling Unit Drills, Reams, Taps and Counterbores

Drilling unit can be used for semi-automatic or fully automatic operations and is adaptable to multiple drilling and reaming. It quickly interlocks with other units or equipment for increased production. Unit can drill, ream, tap, counterbore, center and countersink, and may be used for end or hollow milling, tube flaring, tube facing, chamfering, deburring and boring.

Unit is furnished with either a 2½-in. or a 3½-in. stroke. Speeds range from 245 to 8640 rpm; horsepower, from ¼ to 7½. Motor is 220/440-v, 3-phase, 60 cycle.

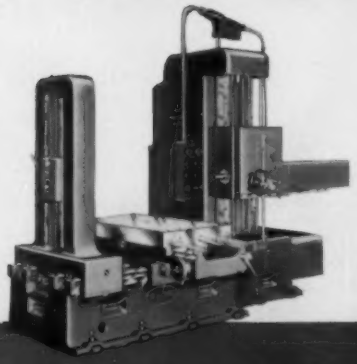
Bedford Gear and Machine Products, Inc, 550 Krick Rd, Bedford, Ohio



SHEAR, Model 1008, is equipped with special, pivoted, angular shearing gage which makes it possible to accurately shear steel sheet at any one of a number of different design angles, within a total angular tolerance of only 2 min of arc. All gage stops are equipped with micrometer adjustments to provide accurate lengths. Speed of shear is 65 spm—*Cincinnati Shaper Co, Cincinnati 25, Ohio*

"THE BULLARD H. B. M. MODEL 75 is the best on the market". . .

"And yet it costs no more than others. Our accuracy is much improved . . . and production has increased 20%—and business is up by at least 30% . . . these factors mean higher profits. The Bullard H. B. M., Model 75 will pay for itself many times over."



Bullard 3" Horizontal Boring, Milling & Drilling Machine, Model 75 one of four models in the complete line.

This statement by the owner of a leading job shop in the Detroit area is typical of the benefits derived when modern Bullard Machine Tools are applied to machining methods and problems.

How about you? If you're not employing the advantages of modern Bullard Machine Tools, your nearest sales engineer will be glad to review their application to your needs.

to cut costs when cutting metal . . . buy BULLARD

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

Always, at SKF, you will receive unbiased advice

because

– All four basic types of anti-friction bearings are available from **SKF.**

because

– They offer an extraordinarily wide range of sizes and combinations to meet virtually any requirement.

because

– Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

because

– Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years – always with good results. This dependable service is available to you, too. 7784

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EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings ("Tyson")*

* Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

FYI

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TOOLS AND ACCESSORIES

1 CARBIDE TECHNICAL MANUAL —*Firth Sterling Inc, 3113 Forbes St, Pittsburgh 30, Penna.* 20-page manual covers manufacture and physical properties of tungsten carbide, Firthite grade selection and application, use of single point tools, and recommended cutting speeds.

● COLLETS—*Sheffer Collet Co, Traverse City, Mich.* 28-page illustrated catalog 57 contains description, dimensions, and prices for complete line of standard collets, pushers, pads, and accessories. Request direct on company letterhead.

2 COOLANTS — *Hans C Bick, Inc, Reading, Penna.* Brochure describes line of coolants for use with mist units. Advantages of misting discussed. Four types of coolants covered with recommended applications, operational data, and prices.

3 DIESET PINS AND BUSHINGS—*E W Bliss Co, Die Supply Div, Cleveland, Ohio.* 8-page catalog 70-A (section 3) describes line of precision guide pins, shoulder guide pins and bushings and commercial guide pins and bushings. Includes specifications and list prices for each.

4 "'DAG' DISPERSIONS FOR INDUSTRY" — *Acheson Colloids Co, Port Huron, Mich.* 4-page bulletin lists colloidal and semi-colloidal dispersions of graphite, molybdenum disulfide, mica, vermiculite, iron oxide, acetylene black, and copper. Carriers and diluents are given for each product, together with typical applications and important physical data.

5 AUTOMATED GROOVE GRINDING —*Jones & Lamson Machine Co, Springfield, Vt.* Second progress report on new perpetual form control for grinding wheel dressing discusses basic principle, process, features, plus examples of narrow dimensional limit groove grinding on an automated basis.

6 CONVERSION FACTORS WALL CHART—*Precision Equipment Co, 4401 N Ravenswood Ave, Chicago 40, Ill.* Includes common conversions such as inches to centimeters, watts to hp, cu ft to liters, microns to meters.

7 UNIVAC II DATA AUTOMATION SYSTEM—*Remington Rand Univac, 315 Fourth Ave, New York 10, NY.* 79-page manual U 23 includes description and illustration of all available equipments and their function; non-technical guide to the binary number system and the seven-place code of the Univac II system; technical discussion of how the central computer is organized functionally; explanation of system's entire repertoire of instructions, and illustrations of how computer responds to special conditions.

HEAT TREATING AND WELDING

8 SPOT AND PROJECTION PRESS WELDERS — *Precision Welder & Flexopress Corp, 3520 Ibsen Ave, Cincinnati 8, Ohio.* 8-page bulletin P-101 lists specifications for entire line including resistance welders from 30 to 600 kva, 1275 to 18,000 lbs electrode forces, 12 to 30-in. throat depth. Covers variety of air cylinder and electrode arrangements, optional features; examples of special tooling illustrated and described.

9 OVENS AND FURNACES—*Blue M Electric Co, 138th & Chatham St, Blue Island, Ill.* 48-page miniature catalog M-57 contains illustrated descriptions of complete line of electric ovens, furnaces, Magni-Whirl water and oil baths, environmental cabinets and controlled temp equipment. Condensed specifications give size, temp ranges, voltages, and capacities.

PLANT SERVICE EQUIPMENT

10 ELECTRIC FORK LIFT TRUCK—*Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill.* Pair of illustrated brochures contain data on the Elbolift, available in 12,000 to 20,000-lb capacities. Design eliminates upright chan-

Fill in number of each bulletin wanted

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City _____ State _____

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FYI FOR YOUR INFORMATION

nels, chains, and sprockets, resulting in reduction in weight and over-all length and width. Specifications and performance data included.

11 INDUSTRIAL WAXES—*S C Johnson & Son, Inc, Industrial Products Dept, Racine, Wis.* Set of four booklets describes clear wax emulsions for protective coatings and dry film lubricants. Products are recommended for use over phosphated, bonderized, anodized, and most other treated surfaces. Technical and application data, physical properties included.

12 FORK LIFT TRUCK DRIVE—*Allis-Chalmers Manufacturing Co, Buda Div, Milwaukee, Wis.* 8-page booklet BU-465 illustrates and describes new power shift torque converter drive. Features and operating advantages discussed.

13 CENTRIFUGAL FANS—*Ilg Electric Ventilating Co, 9350 N Pulaski Rd, Chicago 41, Ill.* 32-page bulletin 257 gives engineering data on BC Airfoil units for all types of ventilating and air conditioning installations. Capacity tables, dimensional drawings, suggested application arrangements provided for each model.

14 LIFTER-DUMPER — *Essex Conveyors, Inc, 165 Franklin Ave, Nutley 10, NJ.* 8-page catalog provides information on Cesco line of Skip-Hoist multi-purpose dumpers for handling bags, boxes, bulk, drums up to 75,000 lb per hr. Applications illustrated, specifications tabulated.

15 INDUSTRIAL EQUIPMENT—*General Industrial Co, 5748 Eldon Ave, Chicago 30, Ill.* 16-page catalog contains illustrated descriptions of all types of plant and office equipment including storage units, stools and chairs, magnesium ladders, special drum handling units, portable tools, ovens and furnaces.

PARTS AND MATERIALS

16 DOUBLE REDUCTION SPEED REDUCERS—*Cone-Drive Gears, Div of Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 20-page catalog CD-230 covers some 164 standard styles and sizes of units in ratios from 75:1 to 4900:1, available in worm over, worm under, or gear shaft vertical models. Output torque ratings range up to 618,000 in.-lb.

17 CLUTCHES FOR PRESS CONVERSIONS—*Minster Machine Co, Minster, Ohio.* 16-page bulletin CC57 discusses features of air friction clutch and brake for reconditioning and modernizing existing mechanical presses. Diagram illustrates action; clutch control data and physical inventory of equipment used in a conversion listed.

18 SS FASTENERS — *Allmetal Screw Products Co, 821 Stewart Ave, Garden City, LI, NY.* 12-page catalog gives data on "AN" fasteners; describes government specification aircraft bolts, slotted and Phillips machine screws, flat and round rivets, and washers. Illustrations, stock sizes, dimensions, explanation of part and dash numbers included for each item.

19 TUBE AND BAR STOCK—*Shenango Furnace Co, Centrifugally Cast Products Div, Dover, Ohio.* 6-page bulletin 156 gives details on standard stock now available in three special materials: GC Meehanite Metal, GA Meehanite Metal, and Type No. 1 Ni-Resist, particularly suited for production of bearings, bushings, gears, pistons, pump and valve parts. Applications illustrated, specific features discussed, physical properties chart included.

● ALUMINUM BUS CONDUCTORS—*Kaiser Aluminum & Chemical Sales, Inc, 919 N Michigan Ave, Chicago 11, Ill.* 176-page illustrated technical manual describes and classifies numerous aluminum bus bar shapes and alloys available. Sections discuss fabricating processes, mechanical design, joining, installation methods, and accessories. Request direct on company letterhead.

20 COLD HEADED FASTENERS — *John Hassall, Inc, Westbury, LI, NY.* 17-page illustrated catalog 106 is condensed handbook on design and use of such specialities as rivets, nails, screws, and other fasteners and small parts. Covers cost and design advantages and manufacturing possibilities, plus data on metals and finishes.

21 SPEED VARIATORS—*General Electric Co, Schenectady 5, NY.* 16-page bulletin GEA-6643 illustrates and describes new line of packaged direct-current adjustable speed drives available from 3 through 150 hp, 220, 440, 550 v, 3-phase ac 60 cycle. Power unit data slide rule included for calculating case dimensions, hp, speed range, power unit weight, and motor frame size.

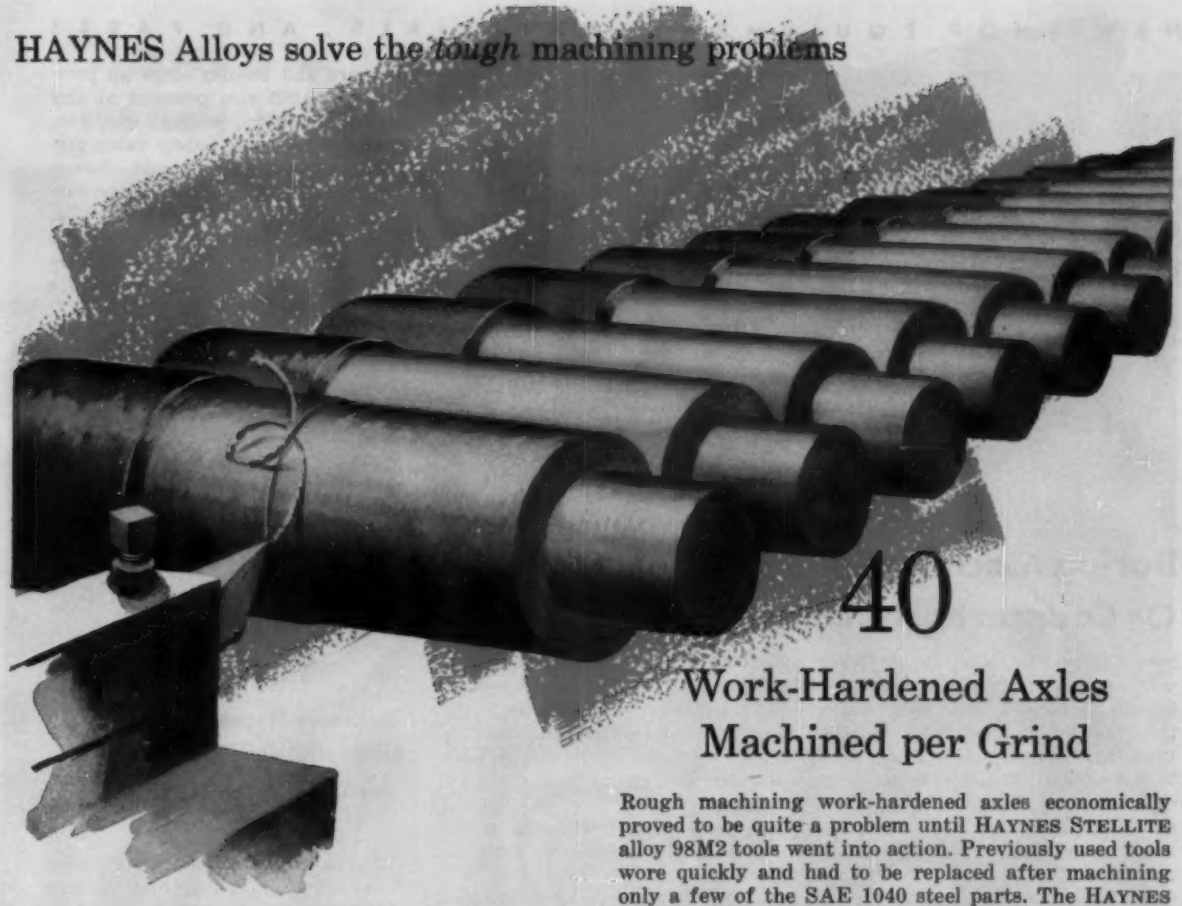
22 CONTROLS — *Hart Manufacturing Co, 110 Bartholomew Ave, Hartford 1, Conn.* "Check List" contains condensed information on line of Diamond H relays, thermostats, rotary switches, range switches, motor controls, and snap-ins.

23 STEEL TUBING—*Copperweld Steel Co, Ohio Seamless Tube Div, Shelby, Ohio.* 8-page catalog CS-58 describes carbon and alloy seamless steel tubing in mechanical, aircraft mechanical, airframe quality and pressure grades. Electric-resistance welded steel tubing, carbon steels, is covered in mechanical and pressure grades.

24 INSTRUMENT AND CONTROL SWITCHES—*Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.* 8-page bulletin 14B3112A gives details on construction features of Type 210 available as either maintained or spring return contact types for use in conjunction with circuit breakers, transformer tap changes, motor-operated rheostats, and other types of electrically controlled apparatus.

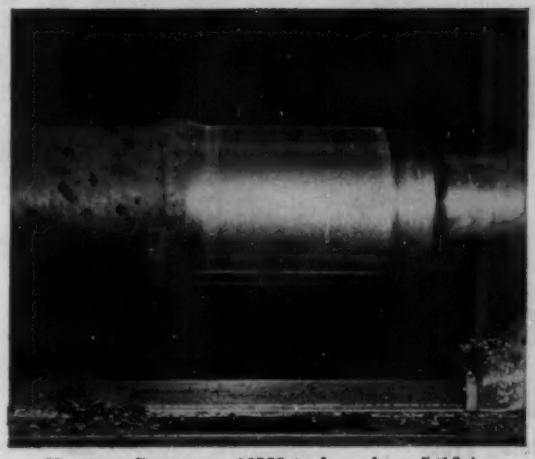
25 SOLENOID VALVES — *Automatic Switch Co, Florham Park, NJ.* 4-page illustrated bulletin contains condensed information on 2, 3, 4-way, corrosion-resistant, manual reset, and special purpose valves. Data included on electromagnetic control covers automatic transfer switches, remote control switches, contactors, relays, solenoids, and electric plant controls.

HAYNES Alloys solve the *tough* machining problems



40 Work-Hardened Axles Machined per Grind

Rough machining work-hardened axles economically proved to be quite a problem until HAYNES STELLITE alloy 98M2 tools went into action. Previously used tools wore quickly and had to be replaced after machining only a few of the SAE 1040 steel parts. The HAYNES STELLITE alloy tools machine 40 axles between grinds and remain in operation for an entire week. During the machining operation the 98M2 alloy tools cut through both hard and soft spots of the work-hardened surface.



HAYNES STELLITE 98M2 tools make a 5/16 to 3/8 in. deep cut on this work-hardened axle. They cut through alternate hard and soft spots of the work-hardened surface. The area machined on each axle is approximately 12 in. wide.

If you have a machining operation that requires a rugged tool alloy that retains its hardness at red heat, can make deep cuts at relatively high speeds, and resists chipping under adverse machining conditions, it will pay you to investigate the complete line of HAYNES STELLITE alloy cutting tools.

For complete information, write HAYNES STELLITE COMPANY, Division of Union Carbide Corporation, Kokomo, Indiana. Or contact our nearest sales office . . . Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, and San Francisco.

HAYNES ALLOYS

HAYNES STELLITE COMPANY

Division of Union Carbide Corporation

Kokomo, Indiana

UNION CARBIDE

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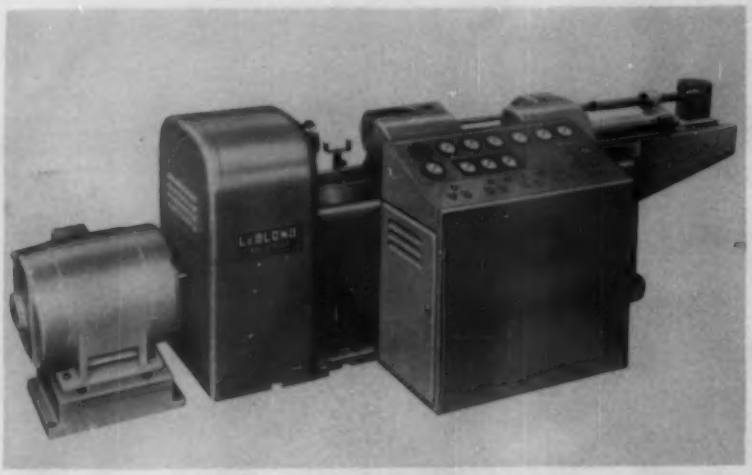
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



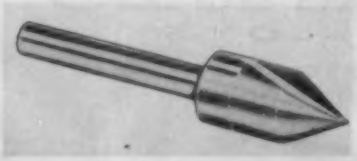
Boring Machine Solid Bores, Trepans Or Counterbores Long Holes

New LeBlond-Carlstedt Rapid Borer will solid bore, trepan or counterbore long holes 3 to 8 times faster than the conventional D-bit method. Unit has capacity for holes from 5/16 to 4¼-in. dia in a large range of work sizes. In general, it is best suited to work that is, or can be made symmetrical for balance in rotation.

Machine was designed to accommodate new tooling which cuts at very high speed with excellent accuracy and finish. Cutting oil is forced between the boring bar and hole wall, forming a continuous bearing. It flushes back through a hole in the boring head and bar, carrying away chips as it goes. Cutter design produces balanced cutting pressures thereby controlling concentricity.

Other features include high spindle horsepower; vibrationless operation at all speeds; infinitely adjustable feeds, independent of speeds. Available in three sizes, No. 15, 30 and 60. Bulletin LC 501-N available.

R K LeBlond Machine Tool Co, Cincinnati 8, Ohio

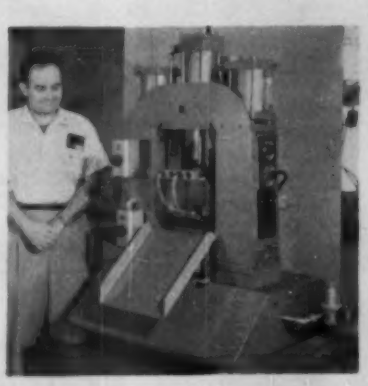


Super Tool Introduces Three New Carbide Tools

Chatterless single-flute solid-carbide countersink, List No. CS, is available in ⅜, ½, and ¾-in.-dia, all ¼-in. shank with 82° taper (standard 60° taper furnished to order). Single-flute solid-carbide center laps List No. CL, in same sizes as countersinks, are offered with 60° taper.

Lower priced line of chucking reamers is being introduced in decimal List No. RCB and fractional List No. RCS sizes from ¼ to ¾ in. Cost is less because shanks are steel, flute section only is solid carbide. Catalog available.

Super Tool Co, 21650 Hoover Rd, Detroit 13, Mich

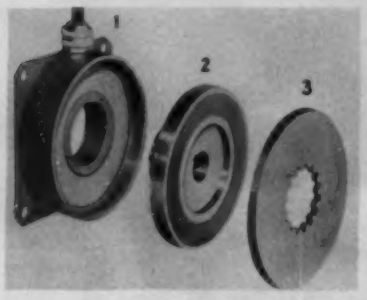


10-ton-Capacity Molding Press For Short Runs and Lab Work

Automite A-10, with manual, semi-automatic, and fully automatic controls, uses the airdraulic principle, so that molder can use his present air supply as source of power, with normal working air pressure of 80 to 100 psi.

With 80 psi working directly on oil, ram moves into position on low pressure and booster steps up pressure to 20,000 ram pressure at any desired location within the 6-in. stroke of the ram. Safety valve prevents over-stressing mold frame, which is an integral part of the machine and can handle a 5 x 6-in. chase plate. Core and cavity can be replaced by removing four screws that hold them to their respective chase plates.

Automatic Molding Machine Co, 3301 Exposition Pl, Los Angeles 18, Calif

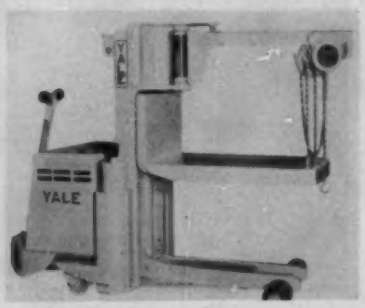


Stationary-Magnet Clutch Eliminates Collector Rings

Model 5 SM incorporates (1) magnet body; (2) drive member; and (3-driven member.

Units are manufactured in sizes from 1⅜ in. in dia up to 5 in., with torque ranges from 25 oz-in. up to 170 in.-lb. All are wound for direct current, with max ratings from 28 v on smaller clutches to 90 v on larger sizes. Details in bulletin 504, Dwg B-731-D.

Stearns Electric Corp, 180 N Broadway, Milwaukee 2, Wis



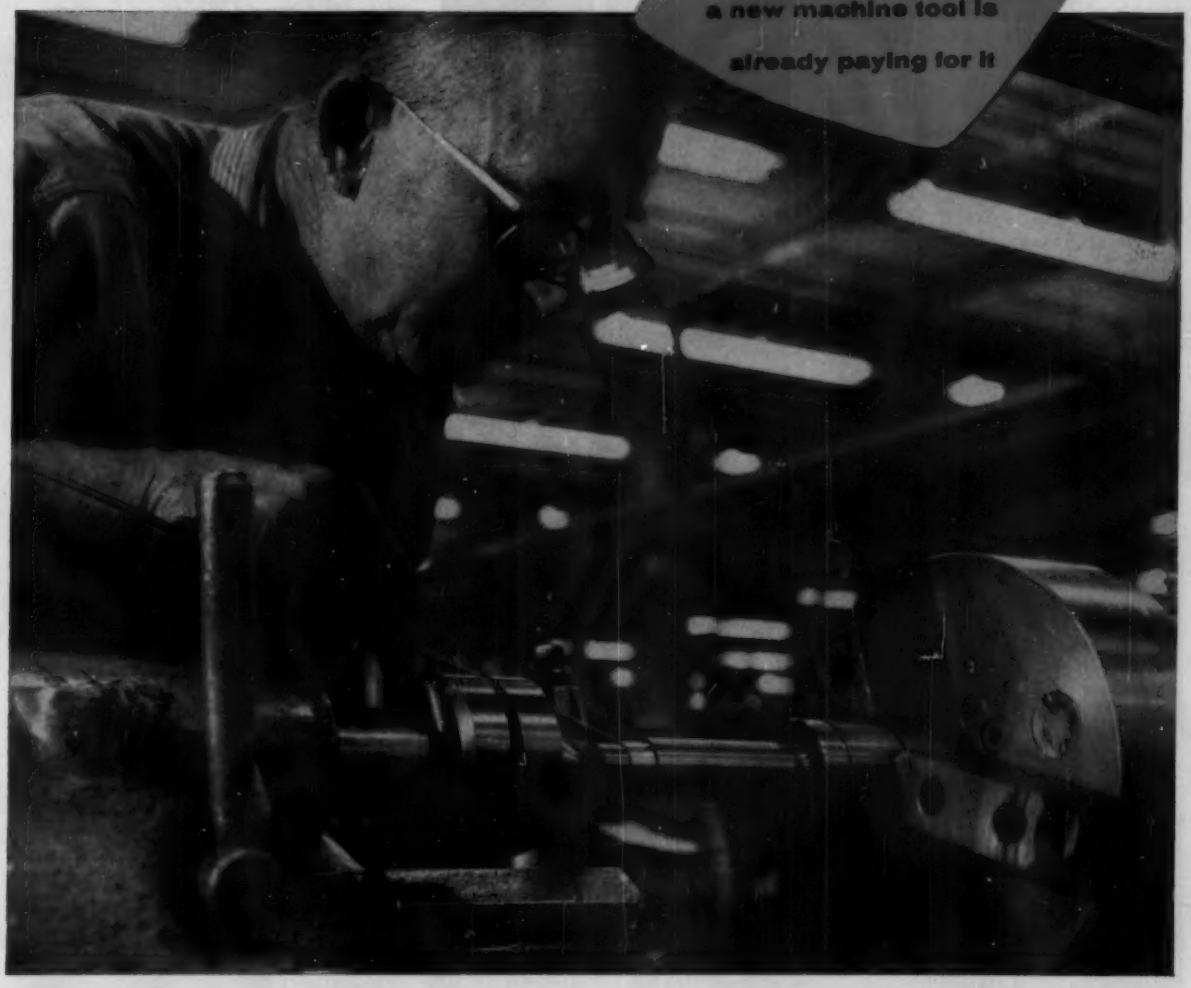
Lift Truck Attachment Transfers Materials From Conveyor Lines

High-lift platform Worksaver trucks are available equipped with a swinging boom to which a ½-ton-capacity Yale spur gear trolley-type hoist is attached.

Boom, of 4-in. I-beam construction, slews through 180°, permitting

JONES & LAMSON MACHINE COMPANY

the man who needs a new machine tool is already paying for it



Still useful, yes . . . but is it still Profitable?

When the purchase of new machine tools comes up for discussion, it's not at all unusual for someone to comment — "but our present machines still seem to be doing a good job".

On the surface, this objection seems to make good sense. It doesn't stand up, however, because it isn't good economics.

While surveying a number of metalworking plants recently, a prominent industrial publisher discovered this startling fact: — *In every plant with machinery more than ten years old, profit margins were steadily falling!*

Why should this be the case, especially when sales were at an all-time high?

The answer, of course, is that older, still "useful" machines cannot produce enough goods at a low enough cost to compete favorably with new machines on a profit basis.

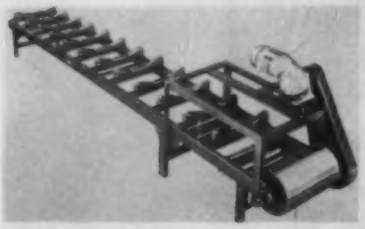
Write for J & L's Replacement Information Kit, which contains much valuable information. Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Threading Dies, Taps & Chasers

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

positioning of hoist over a conveyor line on either side of truck in order to transfer material from line to truck's platform, or vice versa. Because of 90° side loading, capacity of boom is restricted to 750 lb. Boom can be locked in straight forward position during travel, or when truck being used as standard platform carrier.

Yale & Towne Manufacturing Co, Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

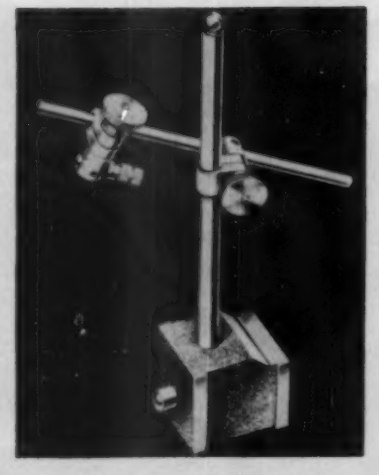


Troughing Belt Conveyor Added to Sage Line

Power-driven, standard-duty unit can be used for handling scrap from punch presses, or similar bulk material.

Drive is mounted above the conveyor. Rubber, neoprene, or canvas belts are supplied, depending on application. Type 162B roller used is 2 in. in diameter and has a 187-12SG ball bearing equipped with neoprene seal, and grease-packed. Units are available in 18 and 24-in. width.

Sage Equipment Co, 30 Essex St, Buffalo 13, NY



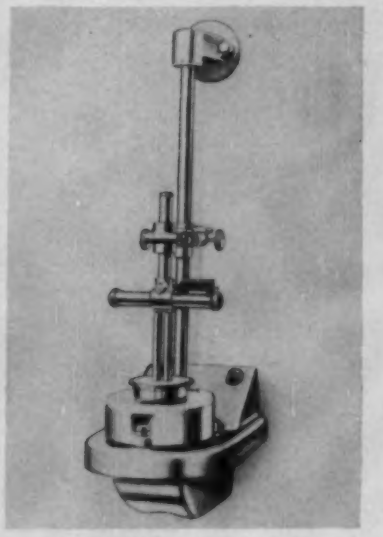
Magnetic-Base Indicator Holder Has ⅜-in.-Dia Upright Post

Indicator holder, designated 657AA, is furnished with the Starrett 657 magnetic base which features a powerful permanent magnet and a large-dia pushbutton for turning the magnetic force on or off.

In addition, the Model 657AA includes a ⅜-in.-dia upright post; a sleeve which holds the stem of the indicator and can be positioned at any height on the upright post; a sleeve which can be positioned along the rod; and an indicator attachment which holds company's lug back indicators.

All working surfaces of the base are precision ground; non-working surfaces have a wrinkle finish. V-step across top of base adapts for mounting on horizontal or vertical arbors. A tapped hole on one side provides a second mounting position for the upright. Dimensions of base are 1 15/16 high by 1⅝ x 1⅞ in. Bulletin available.

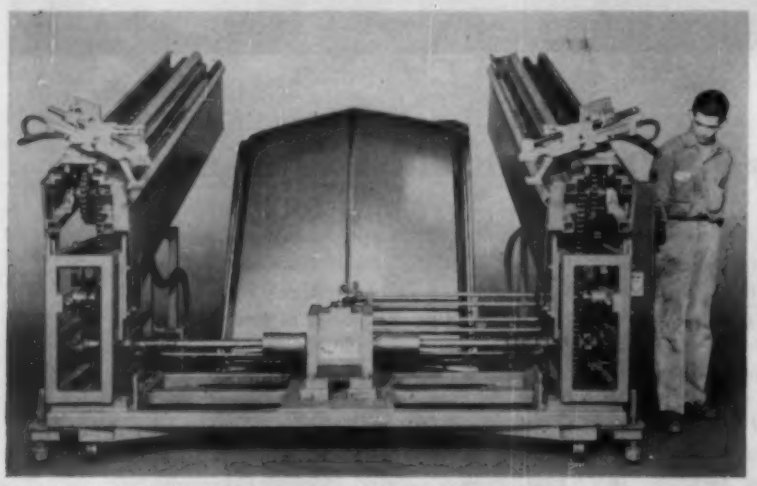
L S Starrett Co, Athol, Mass



Comparator Measures Gage Blocks And Length Bars up to 40 in.

Self-checking comparator, a British product, gives exact measurements of gage blocks and length bars. The wall-mounting type checks gages up to 40 in. in length; bench type, up to 14 in. Readings may be made to 0.000001 in. Because the end bars are positioned vertically the problem of sag need not be considered.

Distributed by Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill



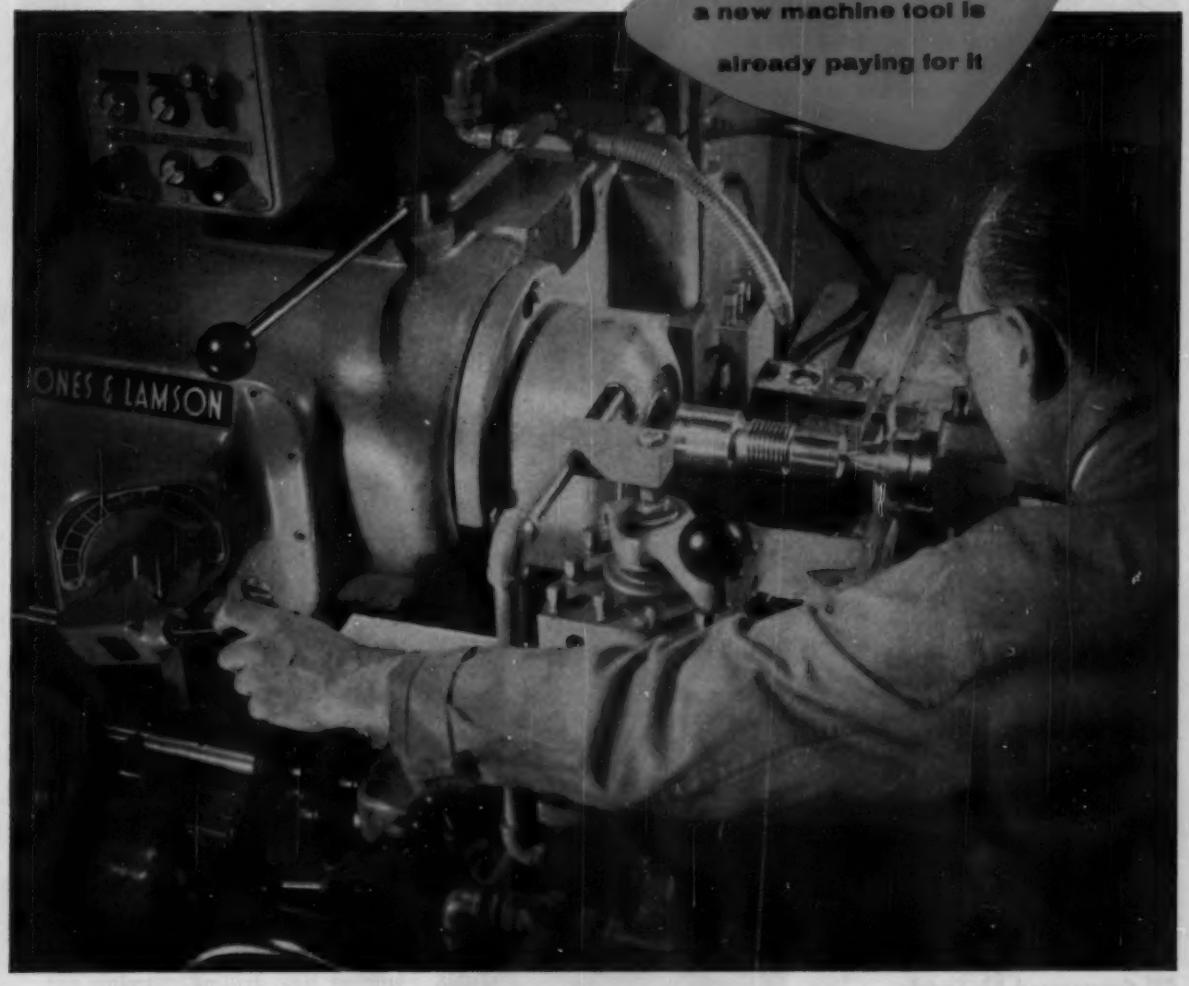
EXTRA-LARGE STAMPINGS are handled on this Dual-Jaw automatic unloader which has two standard mechanical jaw assemblies mounted on individual carriages. Carriages are advanced and retracted by a reversible air motor through a roller chain drive. Jaw assemblies swivel in any plane for universal adjustment —*Press Automation Systems, Inc, 25418 Ryan Rd, Centerline, Mich*

Hole Gage Measures Small Hole Diameters With Countersinks

Model C Kwik-Check hole gages afford rapid and accurate measurement of small hole diameters with countersinks. They compensate for

JONES & LAMSON
MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it



The Turret Lathe with a fully automatic thread-chasing cycle!

Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader!

This Auto-Threader will chase straight or taper threads — or a combination — internal or external, from the front of the machine.

Other features include: uniform thread length, by means of positive stop and follower nut disengagement together with rapid tool withdrawal; precision lead control by full depth follower nut engagement on a hardened and ground leader.

Write for descriptive folder No. 5440. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Threading Dies, Taps & Chasers

the countersink by measuring the hole dia at the base of the countersink, not the countersink itself. Operation is identical to that described for the earlier models (*AM*—May 6, '57, p180).

No. 20-C covers the range from 0.025 to 0.130 in.; No. 30-C, 0.130 to 0.255 in.; No. 40-C, 0.255 to 0.388 in. Direct reading scale is marked in increments of 0.001 in. and is equipped with a 2½-power magnifier. No. 20-C sells for $48.50; Nos. 30-C and 40-C, $52.50 each. Complete set is priced at $148.50.

Also available is Kit C, which provides interchangeable countersink heads for all models of the gage. Kit sells for $35. Prices for individual heads are: No. 20, $10; Nos. 30 and 40, $14 each.

Hamilton Watch Co, Allied Products Div, Lancaster, Penna

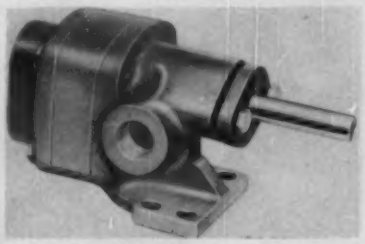
Air-Hydraulic Press Operates Off Compressed Air Supply

Designed for bending, straightening and forcing, this air-operated hydraulic press is available in 16 models, ranging in capacity from 25 to 150 tons.

The rapid ram approach does away with handwheels. When control knob is turned, the ram advances at high speed until it comes into contact with the work. Then it automatically changes to the power stroke. The movable workhead is self-contained, and easy to center over the work. It can be purchased separately. All operating controls and pressure gages are at convenient working height.

Standard equipment includes structural steel frame, workhead, pressure gage, safety valve, table-lifting device, two table plates, two V-blocks, round nose for pressing, V-ram nose for straightening, and a stroke indicator. Prices start at $675 fob. Bulletin 391.

Dake Corp, Grand Haven, Mich



Rotary Pump Delivers 25 gpm At Pressures to 500 psi

Unit, available in sizes 1 through 4, is designed for applications requiring a lowcost, heavy-duty pump for continuous service at pressures to 500 psi in capacities to 25 gpm. Suction and discharge openings are from ½ to 1 in. NPT.

Features include few operating parts; nodular iron herringbone gears; four force-feed lubricated roller bearings; replaceable steel-backed, bronze wear plates; and single stuffing box available with packing or mechanical seal for minimum leakage.

Worthington Corp, Harrison, NJ

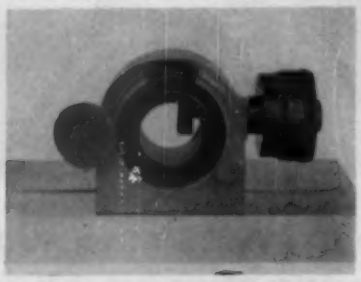


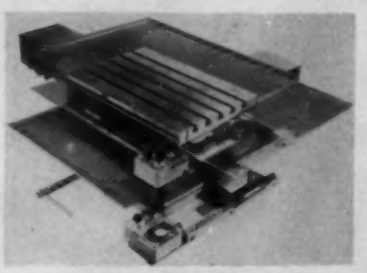
Chart Layout Instrument Has Many Uses in Projection Gaging

New instrument, called the Chart Layout Instrument, permits making chart-gage layouts directly on the viewing screen of optical projectors; provides a fast and accurate means of checking accuracy of charts furnished by vendors; and also serves as a means of checking accuracy of magnification of the optical projector itself.

Instrument consists of a large-drum 0.0001-in. direct-reading micrometer with a special target blade assembly mounted on the end of a non-rotating anvil. Projection of the target blade results in a clearly defined straight line image on the viewing screen of the projector.

Operator simply positions a straightedge tangent to the target image and constructs pencil, ink or scribed lines directly on chart material. Micrometer has a full 1-in. range which permits covering an area of 10 sq in. when using 10X magnification. The head, fitted with a protractor and vernier for angular settings, pivots through 180° and can be locked at any position. This is useful for construction of chamfers, special angles of taper, and other angular constructions.

Automation Gages Inc, Sibley Tower Bldg, Rochester 4, NY



Positioning Unit Will Duplicate To Less Than 0.001 in.

Automatic Positioning Spacer Table, developed to bring the advantages of automatic positioning to any shop equipped with a drilling or boring spindle, embodies simple manual operation learned by any drillpress operator in a few minutes, and is low in cost.

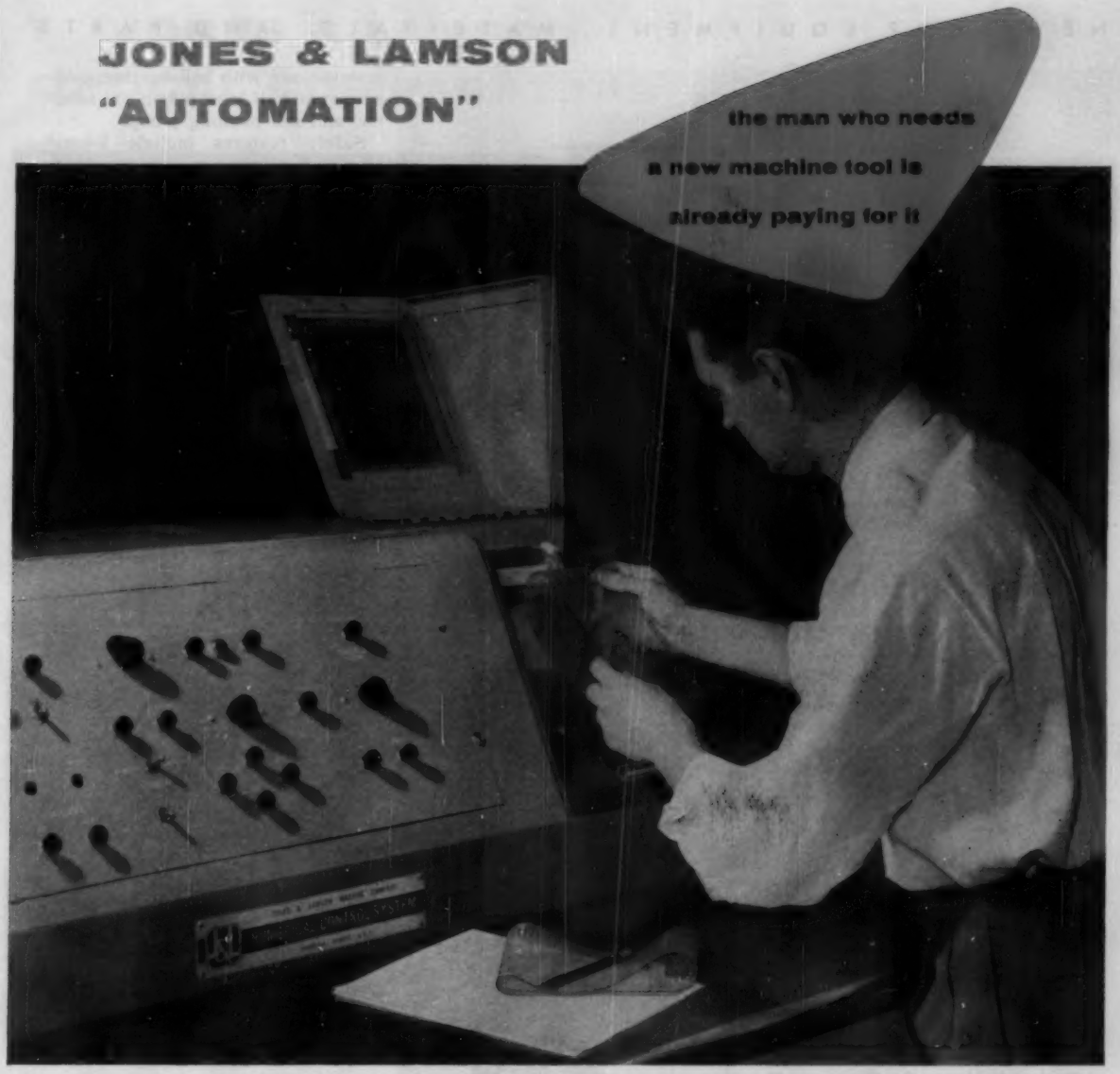
Accuracy depends solely upon the accuracy of the spindle used. Drilling and tapping may be performed without jigs; drilling, reaming and boring are done to close tolerances without boring fixtures.

Locations may be established by any of a wide variety of methods. For the first workpiece, locations may be established with gage blocks or micrometers. Practically any measuring units can be employed. The table will accommodate Duplitrol Bars (made by DeVlieg Machine Co), which may be purchased to individual specifications or to 1-in. spacings.

Table top area is 16 x 24 in. Longitudinal travel is 18 in.; cross travel, 14 in. Unit operates on 110v, 60c (1/3 hp max), has over-all dimensions of 42 x 48 in., and weighs 850 lb.

Industrial East Co, PO Box 561, Clifton, NJ

JONES & LAMSON "AUTOMATION"



J&L's Unique Approach to "Automation"

"Automation" is a tricky word — one that has many definitions. However, at Jones & Lamson its basic meaning is always the same . . . "the solution to a cost reduction problem".

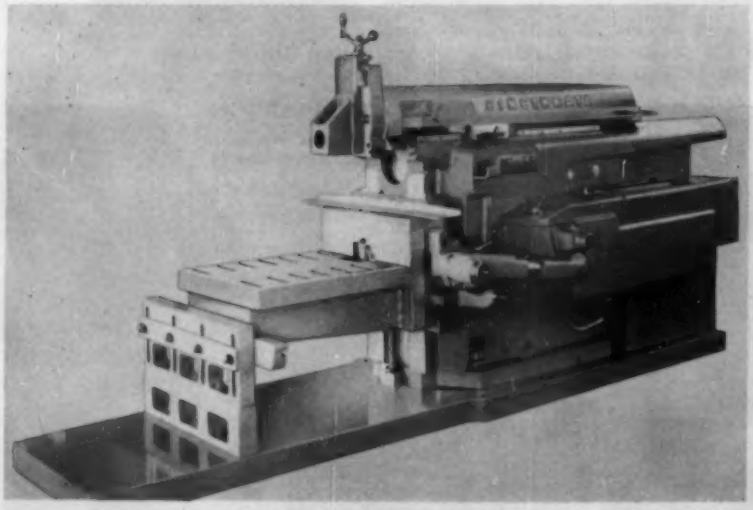
In some cases, this could involve automatic in-process gaging, size adjustment feed back, self-resetting of tools, and automatic handling for long runs on single machines. Other problems might call for an articulated, sequential *line* of machines, complete with automatic handling, inter-machine transfer and automatic control of speeds, feeds, etc.

Through numerical control, using punched tapes, J&L "automation" *also greatly increases small-lot flexibility.* In this case, machine set-up and change-over become primarily an office procedure.

We would be pleased to show you how J&L's approach to "Automation" can be put to good use in *your* operations. Write for literature — Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Threading Dies, Taps & Chasers

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Cincinnati Heavy-Duty Shaper Features Automatic Lubrication

This 36-in. heavy-duty shaper is equipped for machining internal gate valve guides. Features include automatic power down-feed to the special ram head, special-clearance table to accommodate large castings, and extended steel base plate.

Maximum rigidity is provided by slot-free ram and extended-ram bearing construction. Exclusive 50-psi automatic lubrication system maintains a pressured oil film at all important moving connections. Brushless electro-magnetic clutch and brake with finger-tip control simplify operation and reduce operator fatigue.

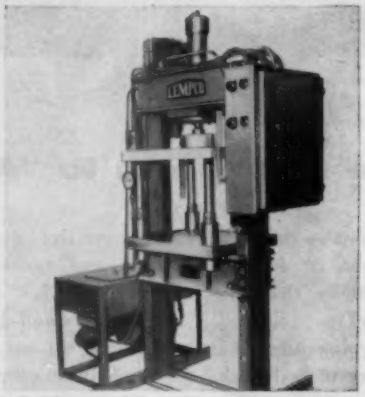
Cincinnati Shaper Co, Cincinnati 25, Ohio

Line of Belt Conveyors Built From Pre-Fab Components

New line of belt conveyors known as Arr-O-Unit-Veyors can be built up from pre-fabricated sections. Each conveyor is made up of separate drive, take-up, and intermediate bed sections that are easily assembled—just bolt the sections together, mount the supports, install the belt, connect the power source and the unit is ready to operate.

Conveyors are available in 5 to 100-ft length for stationary operation, 5 to 25-ft length for portable use. They have belt widths from 6 to 30 in., 1/3 through 1-hp motors for fixed or variable speeds, with belt trough or side leaves, in any combination. Bulletin available.

Arrow Products, Inc, South Ferry St, Grand Haven, Mich



Lempco Trim Press Features Fast Approach and Retraction Speeds

Model TP5-644 die-casting trim press features fast approach and retraction speeds, and adjustable limit switches to control open and shut heights. It is designed for minimum maintenance with ball-bearing-guided platen, ball-joint piston rod adapter, and self-priming pump.

Safety features include 2-hand "throw-in" and instantaneous deadman stop. Press is available in capacities of 5 to 25 tons. Trim area range from 20 x 23 in. to 41 x 41 in.; stroke from 16 to 24 in.

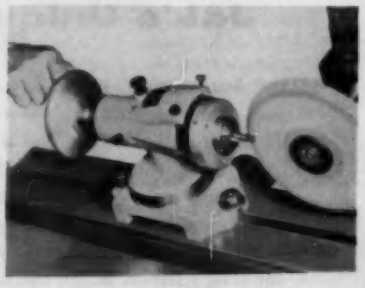
Lempco Industrial, Inc, Machine & Tool Div, Bedford, Ohio

Compact Hydraulic Lift Table Has 1000-lb Capacity

Model L-103, designed to operate in close quarters, has been added to Crown's E-Z Lift line.

Manual operation of hydraulic pump raises load to desired level; lowering is accomplished by opening release valve located next to the pumping handle. Lifting height is 48 in.; over-all height of unit is 60 in.; platform measures 15 x 20 in. Model is equipped with two 4-in. wheels on the front and two 4-in. swivel casters on rear.

Crown Controls, Co, Inc, New Bremen, Ohio

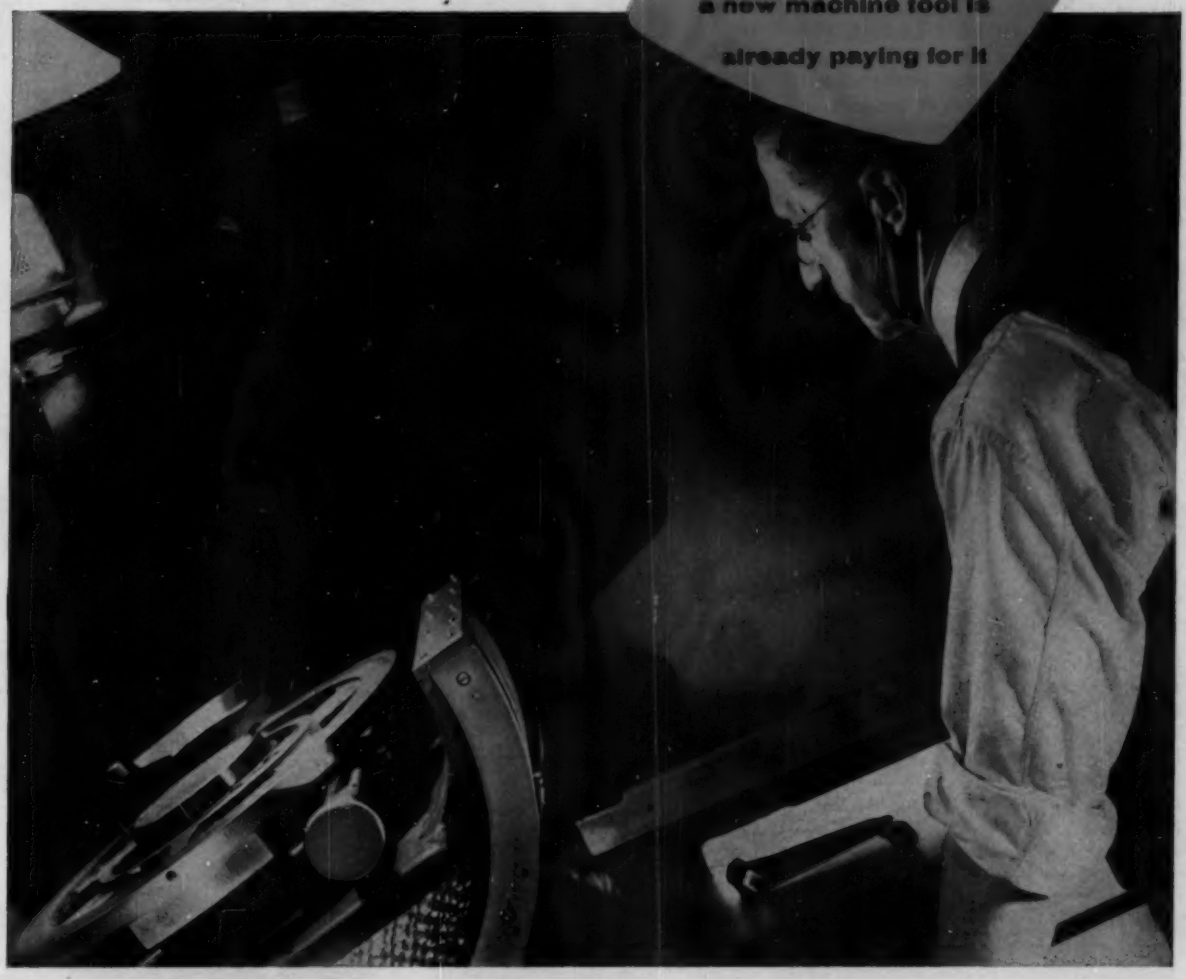


Relief Grinding Attachment Attaches to Any Standard Grinder

Relief grinding attachment called Steptool is said to perform 90% of all grinding jobs which would nor-

JONES & LAMSON OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it



Simulated machining operations give production control as well as absolute inspection

At J&L we answer an inspection problem by asking, "How was the piece made?"

Take, for instance, this inspection of broached slots in turbine discs. Holding fixtures are similar to those used in the actual broaching operation. Measurements are taken, right and left, as on the broaching machine. During inspection, the part moves in the same planes as it does while it is being machined. And the combination of light, optics and chart act as the cutting tool.

Through this visualization of the machining operation, it is a simple matter for the operator to take measurements on the comparator and then go back to the broaching machine to make any necessary adjustments.

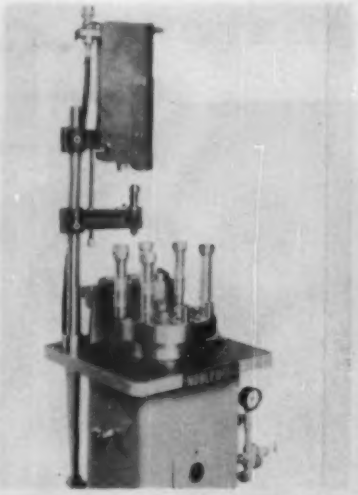
Thus, with J&L, you not only inspect end products but, more importantly, you find out *where* and *when* to adjust the manufacturing process. Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont, for literature.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Threading Dies, Taps & Chasers

mally require a complex fixture costing approximately six times as much. Its infinitely adjustable cam with constant rise and its rapid change for different numbers of flutes, right or left hand, make it a very rapid tool for sharpening such basic tools as taps, countersinks and step-drills. One rotation of the spindle sharpens the tool. One dozen ⅜-in. taps reportedly can be sharpened in 6 min.

Attachment can be motorized for quantity production. It can also be used for cylindrical, index and flute grinding. Ericson or 5-C collets are used; specially designed collets for step-drills. Literature available.

Steptool Grinding & Mfg Co, 3613 E Olympic Blvd, Los Angeles 23, Calif



Automatic Machine Combines Roll Marking and Stamping

Model 486 performs two marking operations on aircraft engine valve tappet guides. Pieces are roll marked with a two-line identification on the smaller OD surface and also stamped with a timing mark on the upper flat surface.

Machine incorporates a motor-driven, continuously rotating work dial with eight studs, or mandrels, over which work is placed. Mandrels support work during marking and permit free rotation as work travels across face of marking die. Idenification marking is accomplished by special interchangeable steel type in a spring-loaded compensating diehead. Time mark is done by an air press, mounted on a post at left rear of machine.

Noble & Westbrook Manufacturing Co, East Hartford, Conn

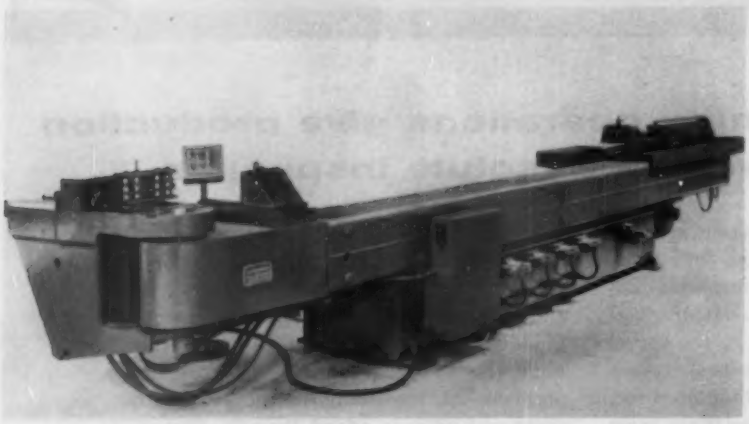
STRAIGHT EDGES, semi-steel, dove tailed, for checking accuracy in scraping dove tails of machine tool beds, are available from 18 to 84 in. in length, in nine standard sizes. Working surfaces are accurate to within 0.0002 of an in. TIR. Standard unit has one side at 45° angle—*Challenge Machinery Co, Grand Haven, Mich*

Vertical Pneumatic Grinder Performs Variety of Jobs

Model 700-V with its 6-in. cup wheel, wire brush, or flexible sanding disk is used for taking down rough spots, or over-all grinding on flat or curved surfaces.

The 11-lb unit, equipped with two handles, operates at speeds from 4500 to 6000 rpm. Thumb-button control adjusts speed. Variety of large cutting surface wheels, sanding and polishing attachments are available. Bulletin 63.

Airetool Manufacturing Co, Springfield, Ohio



ANNEALED FERROUS AND NON-FERROUS TUBING up to 6-in. OD and 20 ft in length can be bent in this 23-ft-long Model 76 Bendmaster. Max bend is 180°; max bend radius is 24 in. Machine performs entire preset bending cycle automatically in one electrically controlled operation. Each step can be performed individually if so desired—*Leonard Precision Products Co, 9200 Bolsa Ave, Santa Ana, Calif*

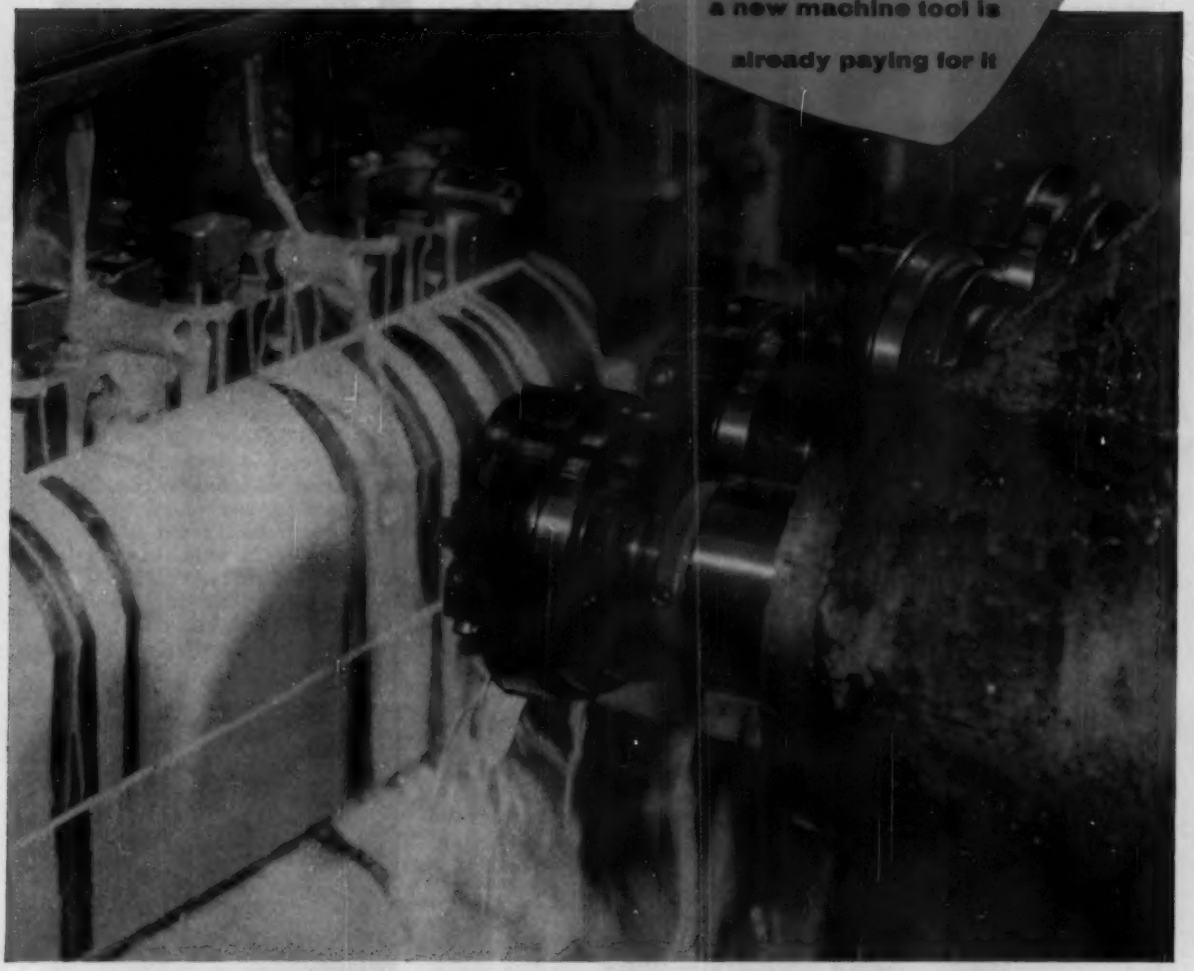
Device Detects Irregularities In Automatic Feeding Machines

Electronic device, known as the Ex-Po-Det Model TC-2-20, is reported to be a new approach to current sensitive control for high-speed, automatic feeding machines. It is an excess power detector which follows accurately the normal work load on the electric drive motor to which it is connected.

While following changes in the normal load, it maintains high sensitivity to momentary increases in motor current. Feed and material

JONES & LAMSON THREAD TOOLS

the man who needs a new machine tool is already paying for it



Wholesale Hollow Milling with J&L Die Heads

This is part of a transfer machine set-up that uses 48 J & L Die Heads on hollow milling operations. Rough and finish turning is performed on both ends of automotive suspension shafts, as 1440 finished parts come off the line every hour.

Even in single spindle set-ups, hollow milling chasers in J & L Die Heads remove metal *four times faster* than single point tooling. And in many cases, J & L threading Die Heads can be adapted to hollow milling, by merely using the required turning chasers.

Chasers for multiple turning and contour forming, as well as straight or taper turning, can be used in J & L Die Heads for hollow milling on most types of turning equipment.

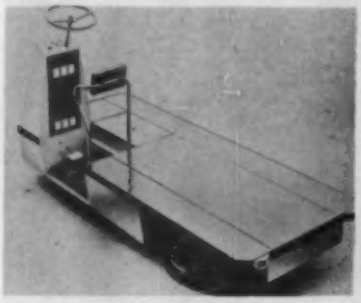
Write for booklets — "Hollow Milling with Die Heads", and "Let's Talk about Thread Tools". Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Threading Dies, Taps & Chasers

irregularities, such as double sheets or ejection failures, are instantly detected and the machine is shut down automatically.

Unit operates on any voltage ac or dc drive motor up to 1100v and up to 20 amps per phase. It is shock mounted in 10 x 8 x 4-in. JIC approved cabinet.

Almy, Hayden & Maxwell, Inc, 8 Anderson St, Marblehead, Mass



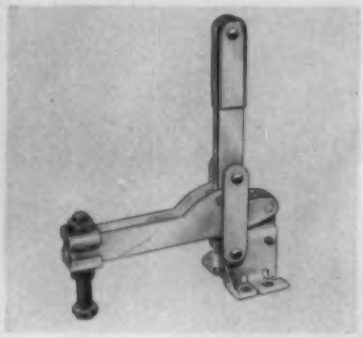
Three-Wheel, Flat-Top Truck Has Payload Capacity of 1 Ton

Three-wheel, flat-top industrial truck, called the One-Ton Lugger, runs on batteries and is designed to operate in narrow factory or warehouse aisles. It has a capacity of one ton and can make a 90° turn at an aisle intersection as narrow as 7 ft.

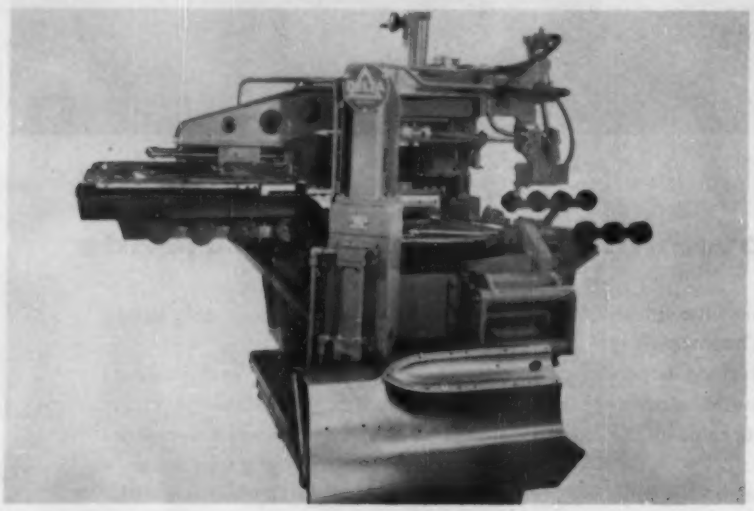
Truck is equipped with company's Dyna-Power direct drive motor and a built-in charger so that batteries may be recharged from any 115-v ac outlet. Batteries, motor and drive mechanism are all below the deck, but are easily reached for service.

Unit weighs 1250 lb, is 108 in. long and 42 in. wide, and has a speed of 6 mph when fully loaded. The price is estimated at $2200 to $2900, depending upon modifications and mechanical requirements. Price includes batteries and battery charger.

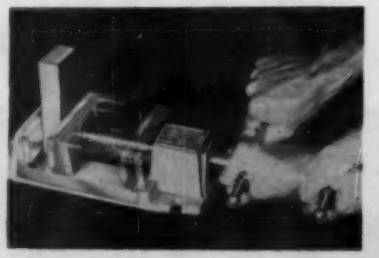
Victor Adding Machine Co, 3900 N Rockwell St, Chicago 18, Ill



800-LB HAND CLAMPS added to Knu-Vise line are equipped with heavy pressure spindles and horizontal rather than inclined toggle bars. Models V-800 and VC-800 available in Vertical Handle series; Models SB-800 and SBC-800 in Swivel Base series—*Lapeer Manufacturing Co, 1150 W Baltimore, Detroit 2, Mich*



CRIMPING MACHINE crimps auto doors, hoods, deck lids or any part, not necessarily automotive, requiring a hem die and press. Known as the Delta Hemmer machine has a capacity in excess of 700 doors per hr. Complete hemming is done in two operations. After the dies retract, the completed door ascends to the shuttle position where it is ejected. It can be adapted to hem any shape—*Delta Welder Corp, 8525 Livernois Ave, Detroit 4, Mich*



Drillpress Vise Combines Rapid Action With Unlimited Takeup

This drillpress vise, which combines rapid action with unlimited takeup, incorporates company's Rapid Titan Nut which engages and disengages the screw automatically. There are no triggers, springs or buttons. Threads are brought into contact with the screw by rotating vise handle in tightening direction. Screw is released for free sliding action by turning handle in ccw direction. Loading and unloading time is reported to be reduced by 75%.

Vise is 4½ in. wide, has a solid base, and can be turned on end for accurate 90° drilling. It is only 2¾ in. high but has 1¾ in. jaw depth.

Wilton Tool Mfg Co, Inc, Schiller Park, Ill

Ipsen Loaders and Unloaders For Automatic Heat Treaters

New models have been introduced for handling work in and out of Ispen units. Loader incorporates a roller platform with table-type mechanism. Primary pusher bar, activated by parallel chains, moves the work tray forward off roller platform; secondary pusher bar fully advances tray into desired position. Chain-driven mechanism then retracts, ready for next cycle.

Basically similar in design, unloaders reverse loading action by extending grab-bars through open

if you GRIND, DRILL, DRIVE, CHIP, LIFT or BOLT

Chippers and Scalers—Start smoothly, hold easily, have fine throttling control.

Screwdrivers—Reversible and non-reversible types to drive any size threaded fastener to ¼". "One-Shot" clutches assure proper fastener tightness.

Drills—Reversible and non-reversible in straight or angle models to 3" capacity.

Impact Wrenches—Forty-one models available. Capacities to 1¾" bolt size.

Hoists—300, 500, 700, 1000 pound capacities. Pull chain control or remote control available.

Grinders—High torque air grinders in straight, angle and die grinder models. Sanders and wire brush machines also available.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

discharge door, automatically grasping work tray and bringing it out of chamber into position upon roller platform.

Both units are available for stationary mounting, or can be equipped with either free-running or motor-driven wheels on track for transverse servicing of a number of furnaces.

Ipsen Industries, Inc, 721 S Main St, Rockford, Ill

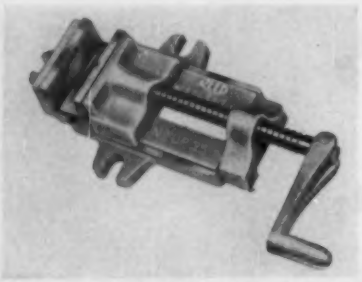
Semi-Automatic Machine Deburrs Gears, Splines and Serrated Parts

The Morrisflex Model MA-660 semi-automatic gear deburring machine is designed for use with a polishing lathe and wire brushes to deburr gears, splines and serrated parts. It replaces hand deburring and makes it possible for even unskilled workers to produce uniform finishes.

Rotation of work, constant pressure against the brushes, and dwell time are all controlled by the machine. Work head, located at top of traversing arm, rotates at 80 rpm and can be adjusted vertically and horizontally. A leadscrew, operated by a handwheel, provides lateral adjustment of the traversing arm to center the work between brushes. Stroke motion of the arm is provided by a double-acting pneumatic cam. After correct dwell time a preset timer switch shuts off the machine and the pneumatic system withdraws the work from the brushes.

Machine is made by B O Morris Ltd, Coventry, England.

Distributed by Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich



Design of Drillpress Vise Reduces Play and Distributes Wear

Utility drillpress vise is designed primarily as a basic workholding tool for use in drillpresses and other production and job work, but it is readily adaptable for work on special pieces, jigs and fixtures.

A large bearing surface links screw to rear jaw to distribute wear and reduce play; a rectangular steel base plate secured by two bolts further reduces wear. All critical surfaces are machined parallel or perpendicular to the base.

Model DP35 (illustrated) has jaws which open to 4¾ in. and measure 3½ in. wide and 1½ in. deep. Model DP50 has jaws which open to 5⅞ in. and measure 5 in. wide and 1¾ in. deep. The first weighs 12½ lb; the second, 24½ lb. Both are finished in soft green. Bulletin DP-81.

Reed Mfg Co, Erie, Penna

Process Protects Steel Parts Against Liquid Aluminum Attack

Method, called Borocote process, for protection of steel and cast iron parts against attack by liquid aluminum, uses chromium boride rods and flame-sprays them in a new type of metal-spraying equipment, the Borocote Metallizer. Coating on the surface reportedly completely prevents wetting of the coated steel or iron by the molten aluminum. Oxidation resistance is up to 1800 F.

Metallizing Co of America, 3520 W Carroll Ave, Chicago 24, Ill

Heavy-Duty Impact Wrench Has Reversing Button

Model 8100 air-powered impact wrench, ⅜-in. heavy-duty capacity, has an all-steel nose housing that will withstand severe handling on the toughest jobs. The impact mechanism has been redesigned to offer smoother flow of power and longer life.

In a normal operating cycle, the threaded fastener will spin freely and the wrench will begin impacting only when torque resistance is built up. Exhaust air is used to cool the drive spindle. Other features include a reversing button, built-in automatic oiler and a comfortable hand-fit pistol grip. Air regulator allows adjustment of motor speed to meet torque requirements.

Specifications include spindle offset of 1⅛ in., height of 7 1/32 in, length of 6 13/16 in., and a weight of 6 lb. The 6000-rpm motor, ½-in.-square drive, is rated for ⅜-in. heavy-duty bolts.

Aro Equipment Corp, Bryan, Ohio

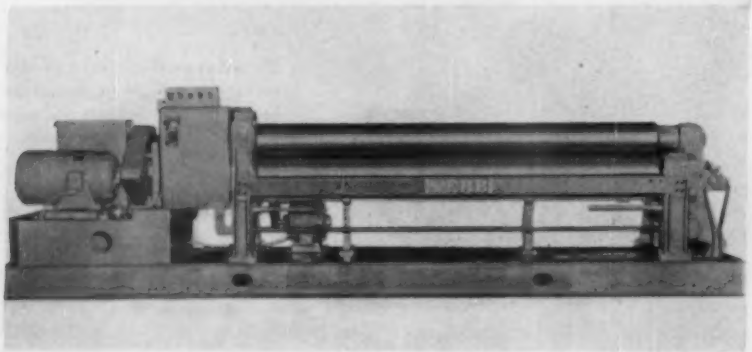


PLATE BENDING ROLL, Initial type Model R3L-R, is built in a range of capacities and sizes from 4 to 10 ft long, for material from gage sizes up to 5/16 in. thick. Regardless of the thickness of the plate, the driving gears are always in mesh—*Webb Corp, PO Box 549, 402 E Broadway, Webb City, Mo*

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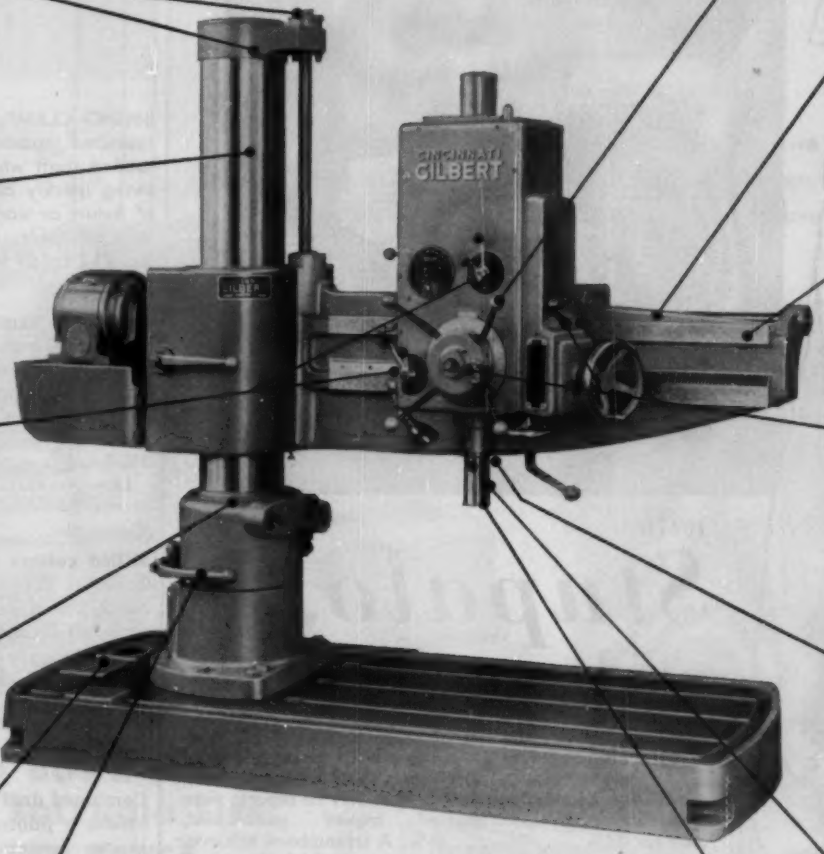
OFFER ALL THESE FEATURES

When you order a Cincinnati Gilbert radial, you get more new features per dollar than any other radial can offer. And every feature is designed to give you maximum return on your investment—in performance, productivity, and dependability.



Safety elevating nut protects both operator and machine

Weight carried on opposed Timken bearings

Hardened column available

Direct-reading speed and feed shifters; gears counterbalanced for easy shifting

Adjustable ball bearing rollers on hardened ring for maintained rigidity

Long heel on heavy base provides 360° stability

Powerful, accurate electric column clamp available

Four-lever turnstile cuts machine handling time

Balanced arm resists torsion, compression, tension forces

Head rides on anti-friction bearings; clamps three surfaces

When disengaging positive feed clutch, spindle won't drop

Full spindle support near tool; runout is less than .001"

Hardened tang slot is an exclusive Gilbert feature

You can always see the spindle; get extra use of spindle travel

And don't overlook these additional features:

- wide range of spindle speeds for efficient tool performance;
- hardened gears throughout the machine;
- standard or special tap leads available;
- modern styling which reduces housekeeping, convinces customers that your shop is up-to-date;

Write or call for Bulletin 349.

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THE CINCINNATI GILBERT MACHINE TOOL CO.
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Production increased up to 10 Times!

costs reduced as much as 75%

with

Stupalox®

oxide cutting tools

Again and again the use of these high strength, high density aluminum oxide cutting tools in actual field service has produced sensational results—accelerating production and slashing costs. Field service reports were astounding—*production doubled . . . tripled . . . quadrupled; costs cut 33% . . . 60% . . . 75%!* A triumphant achievement—fully justifying the thirty years which Stupakoff research engineers devoted to its development.

But that's not all. The use of Stupalox oxide cutting tools has also resulted in faster machining cycles smoother finishes, and longer tool life. That's because of the extreme hardness of the tool material which stands up to temperatures of 2000°F and higher, and its resistance to corrosion by the strongest acids and chemicals normally encountered in machining operations. For complete technical data, write for Catalog 257 *today*.

STUPAKOFF DIVISION OF

The CARBORUNDUM Company

WRITE DEPT. AM LATROBE, PENNSYLVANIA

NEW SHOP EQUIPMENT

SWING CLAMP, designed for use in restricted spaces, utilizes a spring loaded shaft which enables clamp to swing quickly and easily out of way of fixture or work. Work holding bulletin available—*Jergens Tool Specialty Co, 712 E 163 St, Cleveland 10, Ohio*

Dead Blow hammer with replaceable nylon face and hickory handle are stated to be chip- and spark-proof. Three models are available: 2LD has 1½-in.-dia head, weighs 1¼ lb; 3LD, 1¾ head, weighs 1 lb 12 oz; 4LD, 2¼ head, weighs 3 lb.

Lixie Products Co, PO Box 624, Providence, RI

Milled cutters are available in No. 0, 1¼-in. dia; No. 1, 1½-in. dia; and No. 2, 2⅜-in. dia for use with newly designed Johnston-Huntington dresser. Cutters are extra high carbon alloy steel units with heavy, wide teeth.

Machine Products Corp, 125 Hollier St, Dayton 3, Ohio

Combined drill and reamer available makes a piloted hole to be reamed in one operation. Special tools can be made to customer's drawings.

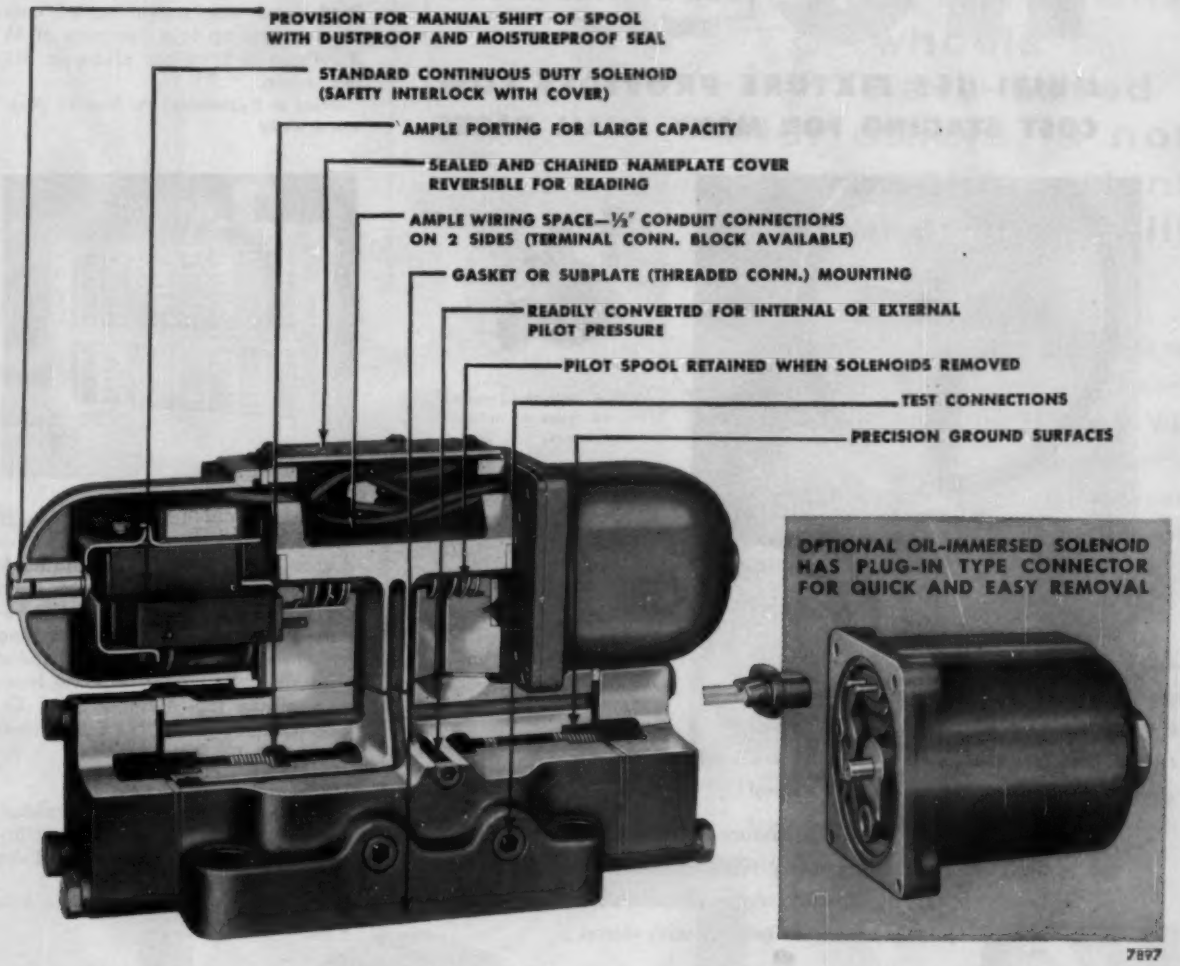
Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

Locknut, reversible and reusable, designated Reverse-Lok, has 360° locking action. Available in steel, brass, aluminum, and stainless, in wide range of standard sizes.

Jacobson Nut Mfg Corp, Box 177, Kenilworth, NJ

Saw blade for cutting stainless has been designed for use with Keesling-developed Handy Angle reciprocating saw. Five sizes of Supreme Blades are currently available in the

Only VICKERS DIRECTIONAL VALVES Have All These Features


PROVISION FOR MANUAL SHIFT OF SPOOL WITH DUSTPROOF AND MOISTUREPROOF SEAL
STANDARD CONTINUOUS DUTY SOLENOID (SAFETY INTERLOCK WITH COVER)
AMPLE PORTING FOR LARGE CAPACITY
SEALED AND CHAINED NAMEPLATE COVER REVERSIBLE FOR READING
AMPLE WIRING SPACE—½" CONDUIT CONNECTIONS ON 2 SIDES (TERMINAL CONN. BLOCK AVAILABLE)
GASKET OR SUBPLATE (THREADED CONN.) MOUNTING
READILY CONVERTED FOR INTERNAL OR EXTERNAL PILOT PRESSURE
PILOT SPOOL RETAINED WHEN SOLENOIDS REMOVED
TEST CONNECTIONS
PRECISION GROUND SURFACES
OPTIONAL OIL-IMMERSED SOLENOID HAS PLUG-IN TYPE CONNECTOR FOR QUICK AND EASY REMOVAL
7897

REDUCED DOWN-TIME
LONGER SOLENOID LIFE
LESS MAINTENANCE
EASIER INSTALLATION

Vickers hydraulic 2- and 4-way valves provide the optimum in directional control. They are compact, versatile, and are designed for heavy duty, continuous and rapid cycling operation on all types of industrial machinery. More than a decade of application experience and years of research and development back all the valves' features.

Seven spool types satisfy a wide variety of circuit needs and operate at pressures to 3000 psi. Optional oil-immersed solenoids operate cooler, increasing service life 20 to 30 times.

Installation is simplified with ease of wiring and a minimum of piping. The valves are available for gasket or sub-plate mounting. Mounting position is unrestricted except in "no-spring" models. The optional oil-immersed solenoid has a plug-in type connector and is available in all standard voltages. Field modification of existing units can be made to incorporate heavy-duty, oil-immersed solenoids.

The valves conform to JIC Standards and are available in ⅛" and ¼" direct solenoid operated models . . . ¾", 1¼", 2", and 3" solenoid controlled pilot operated models. These valves cover the flow range from 1.25 gpm to 320 gpm.

For further information, write for Installation Drawing I-182412.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WORCESTER

FACTORIES ALSO IN AUSTRALIA, ENGLAND AND GERMANY
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto and Montreal

new FOR OPTICAL GAGING

MULTI-USE FIXTURE PROVIDES LOW COST STAGING FOR MANY SMALL PARTS

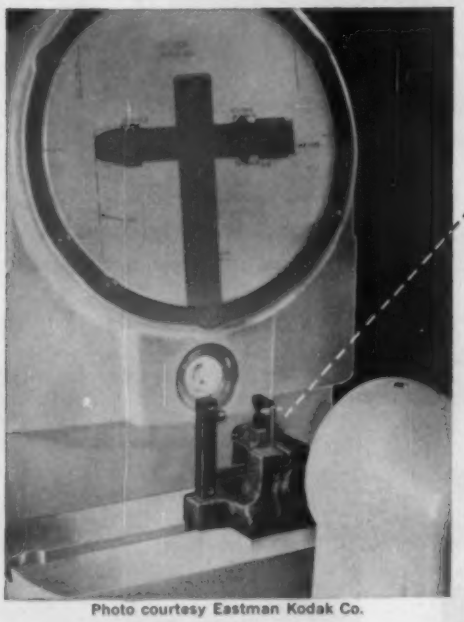
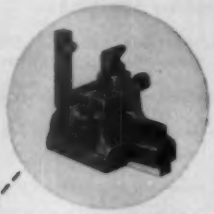
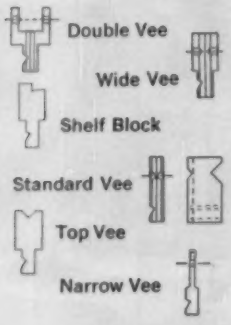


Photo courtesy Eastman Kodak Co.



O. G. P. Multi-Use Fixture fits all types of optical comparators.



O.G.P's NEW Multi-Use Fixture has replaceable part holders designed for holding many types of small parts. Standard holders in varying sizes and shapes are available (see drawings above). Quickly locks into keyway with clamp.

EVERYTHING TO MAKE YOUR OPTICAL COMPARATORS MORE USEFUL

We also supply all types of standard charts, custom charts, layout accessories, fixture bases, and custom fixtures to meet your specialized requirements.

USE THIS COUPON TO GET HELPFUL INFORMATION

OPTICAL GAGING PRODUCTS, INC.
26 Forbes Street, Rochester, New York
I'd like more data on the NEW O. G. P. Multi-Use Fixture.

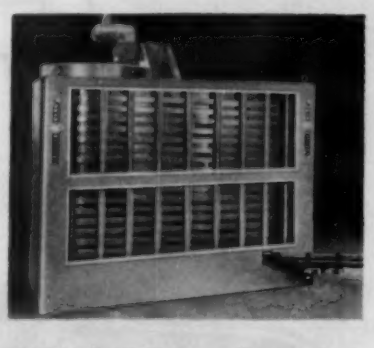
Name ..... Title .....
Firm .....
Street and Number .....
City ..... State .....

OPTICAL GAGING PRODUCTS, INC.
SPECIALISTS IN PROJECTION GAGING

NEW SHOP EQUIPMENT

"bayonet" design (best for contour work) with teeth per inch specifications of 10, 14, 18, 24, and 32, and usable cutting length of 1⅝ in. Blades can also make limited cuts in materials up to a hardness of 55 R_c. Price is $1.10 per blade, or $11 per dozen.

Price & Rutzebeck, PO Box 30, Hayward, Calif



STORAGE UNIT for rolling parts is designed for use in automated production. It offers a true demand feeding system from mobile storage. Parts are moved through unit by motion imparted from two rubber belts rotating lengthwise within the unit. Belt speed is variable. Part enters at lower level; exits at the top—*Michigan Tool Co, Gear-O-Mation Div, 7173 E McNichols Rd, Detroit 12, Mich*

Aluminum paint, called Non Smudge, dries overnight to a surface-fast finish. Product may be applied by brush, spray, or roller.

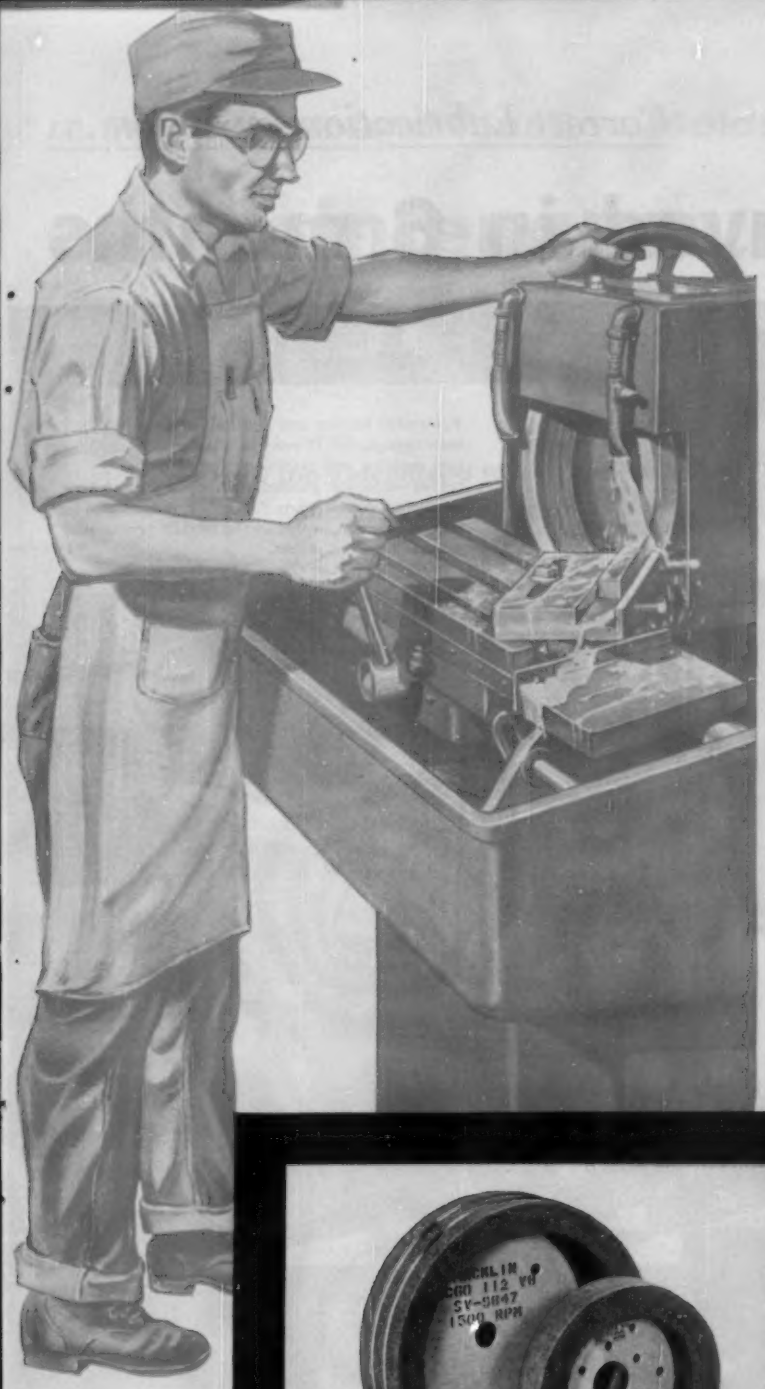
T J Ronan Co, 749 E 135th St, New York 54, NY

Thermostatically controlled valve, Zonvalve, permits temperature control of individual plant areas. Made in standard sizes for easy installation, unit can be attached to the radiator in place of the ordinary radiator valve, or at any point on the supply piping. It is powered by an electric motor and, when in open position, automatically actuates the burner or circulation.

Heat-Timer Corp, 657 Broadway, New York 12, NY

Work glove, designated Mighty-Grip, has a pebble-grained plastic outer surface that is said to provide excellent gripping power. Laboratory tests show that abrasive wear is absorbed by the plastic dots, with little wear in the basic fabric. Fabric is

(Continued on page 174)

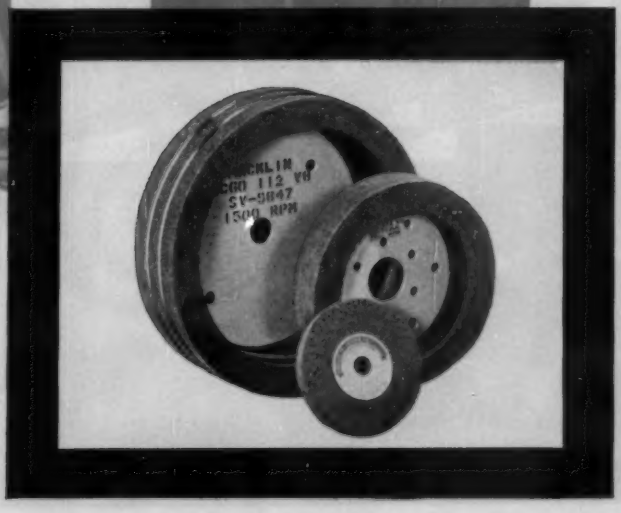


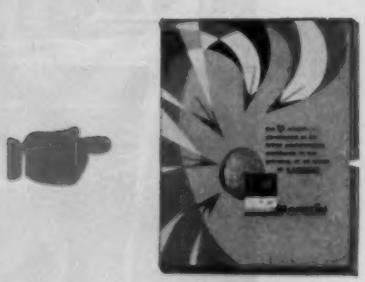
what MACKLIN V-8 wheels have saved for others is not near so important as what they will save you

IF YOU GRIND CARBIDE, you ought to try Macklin's newest "Wheel of Profit" on *your* job to get the FEEL of it. V-8 is easy on tools, easy on the operator's wrist. It cuts *fast* and *cool* without operator fatigue. Production goes up!

Here's proof . . .

V-8 non-slotted wheel saved 10% on purchase price over slotted wheel previously used...and customer reports "Though the V-8 wheel lasted only a couple of hours longer, *it produced almost twice as many tools as the competing wheel.*"





Write today for V-8 literature and wheel recommendations.
While you're at it, arrange for a trial demonstration. Just call your nearest Macklin distributor, or if you prefer, write direct.

MACKLIN company Dept. 70, Jackson, Mich.

MACKLIN OF CANADA, LTD., Harrow, Ont., Canada

Correct Lubrication in Action . . .

$13,388 saved in 6 months

Vulcanized Rubber and Plastics Company has been engaged for 75 years as a leader in precision molding and extrusion of hard and soft rubber—injection molded thermoplastic, and reinforced plastic parts for major industries and, in addition, is one of the world's largest manufacturers of combs.

Mobil **SOCONY MOBIL**

Leader in Lubrication for over 92 years

in the **Rubber and Plastics Molding Industry**

on maintenance, material, man-hours!

How the Vulcanized Rubber and Plastics Company made this substantial saving with the help of Socony Mobil!

In just six months the Vulcanized Rubber and Plastics Company has saved twice the total value of all its oils and greases purchased during the whole year of 1956! Beginning January, 1957, the company protected their Morrisville, Pennsylvania, plant with a Socony Mobil program of Correct Lubrication.

Plant engineer and Mobil lubrication specialists concentrated all their efforts towards improving efficiency of the plant's 42 hydraulic systems. Hydraulic fluids were standardized . . . filtering schedules set up . . . regular maintenance periods established. Periodic Mobil laboratory reports helped check oil quality and efficiency of filtration system.

Savings were swift and sizable. Downtime dropped sharply. Hundreds of repair and maintenance man-hours were eliminated . . . material costs cut. In total, $13,388 saved on the plant's hydraulic systems.

This is Correct Lubrication in Action. The cost-cutting program that devotes Mobil specialists, Mobil facilities, and Mobil's 92 years of lubrication experience to assure utmost protection and full service life from every Mobil product.

SUMMARY OF SAVINGS ACHIEVED THROUGH CORRECT LUBRICATION

* **$1,628 saved on hydraulic oils**—Following Mobil recommendations, plant replaced eight different hydraulic oils with only two Mobil products. This improved dispensing control . . . simplified reclamation . . . cut application time.
* **$2,400 saved on hydraulic system maintenance**—Before Mobil program, maintenance on hydraulic pumps, screens and valves in the injection molding department required two men on full-time basis. Program has proved so effective that equipment today requires only periodic inspection.
* **$100 per month saved on repair parts**—Prior to Mobil program, shafts on Vane-type pumps were snapping due to contaminants wedging into close-tolerance clearances. Cleaner oil and regular application under Mobil program eliminated problem . . . cut repair parts cost $600 in 6 months.
* **$8,760 recovered on press room operation**—Compared to same period in 1956, savings made in Vulcanized Rubber and Plastics Company's Press Room amounted to: $3,960 saved through elimination of downtime. $4,800 cut by reducing maintenance man-hours. Total—$8,760 saved in six months.

Correct Lubrication

A proved program to reduce manufacturing costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

Your Local Warehouses are

Specialists in TOP QUALITY Cold Finished Steels

CARBON • ALLOY • LEADED

PATRONIZE YOUR LOCAL WAREHOUSES. THEIR STOCKS REFLECT AN OVERALL PATTERN OF SIZES AND GRADES ASSURING YOU AT ALL TIMES CONSTANT AND EFFICIENT SERVICE. THEY HAVE WHAT YOU WANT WHEN YOU WANT IT.

SPECIALISTS IN COLD FINISHED STEELS THROUGHOUT AMERICA AND BEYOND
STEEL CENTENNIAL
MANY GROW TOGETHER

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GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
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Ambridge, Pa., Chicago, Ill., Newark, N.J., Putnam, Conn.

WYCKOFF STEEL PRODUCTS
CARBON, ALLOY and LEADED STEELS • TURNED and POLISHED SHAFTING • TURNED and GROUND SHAFTING • WIDE FLATS up to 12" x 2" and 14"x 1¼"
ALL TYPES OF FURNACE TREATED STEELS

light and flexible and allows hand to "breathe." Gloves are said to offer price savings of 17 to 41¢ per pair over comparable gloves.

Riegal Textile Corp, Industrial Glove Div, Conover, NC

Scaffold casters, Series C900 swivel stem and CP900 swivel plate, incorporate double-acting locks that secure mobile equipment until levers are released.

Faultless Caster Corp, Evansville, Ind

CHUCK KEY RETRIEVER, designated Key-Matic, is a keychain-recoil device which attaches to any standard drill-press or lathe. Requiring but a few moments to attach, unit becomes an added safety factor in reducing chance of key being left in chuck. Special chuck-key holder and mounting brackets are included—*Toolcraft Products Co, PO Box 92, South Pasadena, Calif*

Over-riding cranes are available in capacities from 1 to 10 tons and for spans up to 50 ft. Hand-pushed, hand-chain driven, or motor-driven styles can be furnished.

Becker Crane & Conveyor Co, 4900 Ridge Rd, Cleveland 9, Ohio

Rhodium plating solution available provides base metal with an unusually hard, brilliant, platinum-colored metal finish. Scale on each container assures accurate measuring of the liquid content.

Metals & Controls Corp, General Plate Div, Attleboro, Mass

Burnishing compound, Esbec No. 203, for use on aluminum, zinc and copper alloys, steel, and stainless, reportedly produces progressively better results in time cycles up to 24

NEW design

OLOFSSON Precision Boring Machine gives added production advantages

OLOFSSON Model 30-012 Single End Precision Way Boring Machine

PROVIDES FAST, ACCURATE ROUGH AND FINISH BORING, FACING, CHAMFERING, TURNING AND GROOVING.

A TYPICAL APPLICATION

Finish bore, turn o. d., groove, and chamfer zinc die-cast pulley.
Rate of Production:
190 pieces per hour.

These 7 design features give you greater production efficiency . . .

1. New design provides low height to width ratio of spindles to ways.
2. Self contained hydraulic unit, separate from machine, for easy maintenance and elimination of heat problems.
3. Standard commercial hydraulic components throughout.
4. Nickel-iron, one piece ribbed base with integral fixture mounting pad and chip disposal basin.
5. Hardened and ground ways.
6. Conveniently located push-button control panel.
7. Forced feed lubrication.

FIND HOW THE 30-012 FITS YOUR REQUIREMENTS. WRITE FOR LITERATURE.

THE OLOFSSON CORPORATION
Lyons Ave., Lansing, Michigan

MANUFACTURERS OF PRECISION BORING MACHINERY AND SPECIAL MACHINERY

hours. Product can be used for "cut and color" operations where deburring and burnishing is done in one operation in aluminum oxide media.

Esbec Barrel Finishing Corp, 18 Beech St, Byram, Conn

Adapters Double or Triple Range Of Lightweight Torque Wrenches

Used with a torque wrench that has some form of concentrated load positioning, such as the company's Sensory Torque Wrench, these adapters can increase the range two or three times. The 150-ft-lb wrench can be used up to 300 ft-lb; the 200-ft-lb model up to 400 ft-lb; and the 300-ft-lb model can be used for capacities of 600 or 900 ft-lb.

The basic multi-purpose adapter arm fits the drive square on the end of the torque wrench. Any one of the drive-end accessories (shown above) can be attached to the basic adapter. Bulletin available.

P A Sturtevant Co, Addison, Ill

Adjustable port valve, designed for burners on industrial furnaces, ovens, kilns, dryers, retorts, and other control applications, provides accurate control with low operating torque of air or gas flow at pressures up to 25 psig and temperatures up to 400 F.

Hauck Manufacturing Co, 124-36 Tenth St, Brooklyn 15, NY

Aluminum air nozzle allows full control of airflow by operator, weighs less than 6 oz. Thumb pressure releases air from slight puff to full blast with no jumping.

Mortimore Manufacturing Co, 72 Broadmere Rd, Stratford, Conn

High-temperature oil, Anderol L-825, designed for use on conveyor belt operations has operating range up to 500 F continuously and over 600 F for short periods. Product is said to give twice the film strength and load carrying properties and only 25% of the volatility of wide temperature range lubricants previously available commercially.

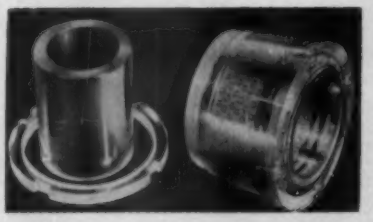
Lehigh Chemical Co, Industrial Div, Chestertown, Md

Titanium blind bolts for structural and repair applications consist of a core bolt, a threaded expander nut which resists installation torque and locks core bolt in place, and a sleeve that expands to fill a hole over a large range of clearances.

Hi-Shear Rivet Tool Co, 2600 W 247th St, Torrance, Calif

All-plastic eyeshield, weighing less than an ounce, is available in large and small sizes, with or without folding side shields. Lens color is either clear or green.

US Safety Service Co, 1535 Walnut St, Kansas City 8, Mo



Line of Arbor Support Bearings Incorporates New Design Principle

Design provides greater bearing contact area, resulting in high load capacity, by utilization of many more balls than conventional anti-friction bearings.

Minimum of space is required to house the ball bearings, permitting a max ID. Inexpensive arbor bearing collars are available, providing wide range of arbor interchangeability. Bearing, seated completely within the arbor support housing, does not project into work area. Units are available in 12 standard sizes to meet requirements of leading makes of milling machines.

Briney Mfg Co, PO Box 2208, Pontiac, Mich

Hand cleaner, Magnus Liqui Lave, is unaffected by hard water; lathers and rinses quickly, leaving no unpleasant odor. Product is usable in dispensers.

Magnus Chemical Co, South Ave, Garwood, NJ

Flexible-tip air blowgun, known as Air-Lok, uses mere finger pressure to control air volume. Device has a non-removable tip with standard

P&W
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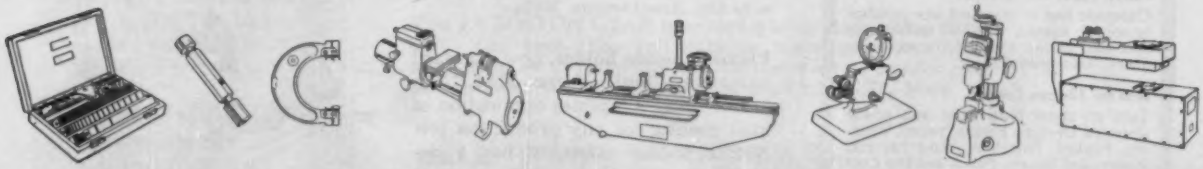
INEXPENSIVE HIGH PRECISION . . . for external gaging. P&W *Sigmatic* Comparators combine the simplicity of mechanical operation with magnifications up to 5000X. Easily portable, require no outside power source.

EXTREME VERSATILITY . . . P&W *Air-O-Limit* Comparators use a variety of internal and external attachments to check a very wide range of products. Readily engineered to meet *your* special requirements.

FOR THE ULTIMATE IN GAGING ACCURACY . . . P&W *Electrolimit* Comparators combine mechanical gaging with electrical magnification up to 100,000X. Errors in "tenths" and "hundredths" are read easily, accurately.

FOR MORE ACCURATE PRODUCTION . . . a P&W *Supermicrometer* is ideal for daily use at the machine or inspection bench. Reads direct to .0001". Controlled measuring pressure eliminates operator's errors.



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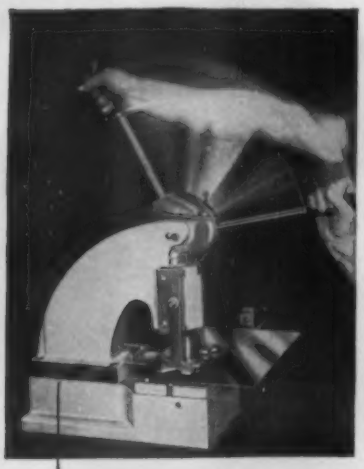
PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS



PUNCH...
BLANK...
EMBOSS...
FORM...

Quickly, Easily, Accurately with a DI-ACRO PUNCH PRESS

Deep throats—6 and 12 inches—of Di-Acro Punch Presses make them ideal for many operations impossible to perform on most bench presses.

Holes of various shapes and sizes—as large as 4" in diameter in 16 gauge steel—can be punched. Vee shaped ram controls position of punch head assuring perfect alignment. Turret stripper, of exclusive Di-Acro design, strips material from punches of all shapes. Side and back gauges provide exact work positioning.

pronounced Die-ack-ro

FOUR HAND AND POWER MODELS AVAILABLE

Di-Acro Power Punch Presses are designed for high speed production. Rated capacity, five tons. 180 strokes per minute. Motor driven flywheel and other moving parts are housed in a welded, steel cabinet.

Hand operated Di-Acro Punch Presses are easy to operate, ideal for short run production and experimental work Rated capacity, four tons.

PUNCH PRESS ACCESSORIES

Complete line of standard size punches in round, square, notcher, rectangular and oval shapes available in six clearances. Also special sizes.

Send for 32-Page Catalog

Tells all about both hand and power operated Di-Acro Punch Presses, Benders, Brakes, Notchers, Rod Parters, Rollers and Shears. Punch and Die Cost Sheet included.

Creators of "Die-Less Duplicating"

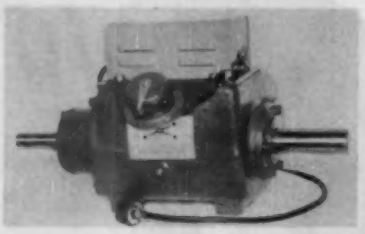
O'NEIL-IRWIN MFG. CO.
311 8th Avenue
Lake City, Minnesota

di-acro PRECISION METALWORKING MACHINES

NEW SHOP EQUIPMENT

orifice, flexible neoprene body, ¼ or ½-in. fittings and an internal air shutoff valve which is fully operable with as little as 20-lb line pressure.

Toolcraft Products Co, PO Box 92, South Pasadena, Calif



Automatic Clutch Transmission Changes Speed Under Power

Model 8100-EC allows for speed changes under power, can also be reversed without stopping or reversing the motor.

Torque rating of input is 700 lb-in., output 2800 lb-in. Capacity of transmission is from 1:1 up to a max reduction of 6:1. With an adapter a reverse is possible with limits up to 3:1. Electric clutches are used to change speeds in connection with tape, time limit, cam, or other automatic controls. Hand control can also be used. Unit occupies space of approximately 20 in. left to right; 12 in. front to back; 11-in. height from base of transmission to top of control instruments. The 120-lb model is built for horizontal mounting only.

Western Manufacturing Co, 3400 Scotten Ave, Detroit 10, Mich

Detergent for cleaning and sterilizing personal equipment such as respirators, face shields, and helmets is available in powdered form in cartons of 25 one-ounce packages, each to be diluted with a gallon of water.

American Optical Co, Safety Products Div, Southbridge, Mass

Flexible nozzle holder, now standard equipment with Mistic Mist Generator units, simplifies application of mist cooling for any production job. Nozzle holder assembly has a detachable, plastic-covered magnet with 60-lb pull for temporary setups.

Aetna Manufacturing Co, 188 S York St, Bensenville, Ill

Electrode wire, Ampco-Trode 160, is available in spooled wire form for joining and overlay with the inert-gas consumable-electrode process. It develops tensile strengths up to 100,000 psi and hardnesses of 190-200 BHN, and is recommended for joining the higher strength, harder aluminum bronzes.

Ampco Metal, Inc, 1745 S 38th St, Milwaukee 46, Wis

Appliqué material, called Aplika, becomes transparent when applied to drawing paper, will take pencil, ink, or printing markings. Furnished in sheet form with special backing in standard sizes of 6 x 9 in. and 8½ x 11 in., sheets are available either plain or printed to any specifications.

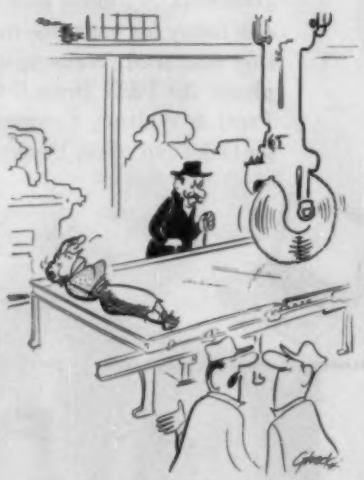
Transparent Products Co, Aplika Dept, 324 E 24th St, New York 10, NY

Gage block maintenance kit is available free with gage block set of 38 pieces or more. It consists of a black granite-diorite deburring stone, camel's hair brush, insulated forceps, large box of lint-free wipes, two factual booklets, and two aerosol containers of specially compounded liquids for gage block care.

DoAll Co, 254 N Laurel Ave, Des Plaines, Ill

Pressed-steel welding flanges are available in 8 sizes from ¼ to 2 in. They are reported to weld easily and are less expensive than forged fittings. Also available in brass, copper and stainless, they can be supplied to fit the contour of user's product. Material ranges in thickness from 10 gage to 3/16 in.

Tech Products, Inc, 442 Mosel Ave, Staten Island 4, NY



"By George, there's a sight you don't often see anymore!"

For fractional to 40 hp drives . . .

BOSTON Gear SPROCKETS and CHAIN

FROM STOCK . . . at Factory Prices

Catalog No. 56 lists
ANY TYPE OR SIZE YOU NEED

.81" to 38.20" P.D.
SPROCKETS, iron and steel, for single **ROLLER CHAIN**

1.92" to 26.74" P.D.
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¼" to 2½" P. **ROLLER CHAIN** single, double, and triple

1.94" to 12.74" P.D.
SPROCKETS, iron and steel, for **BLOCK CHAIN**

⅛" to ½" w. **BLOCK CHAIN**

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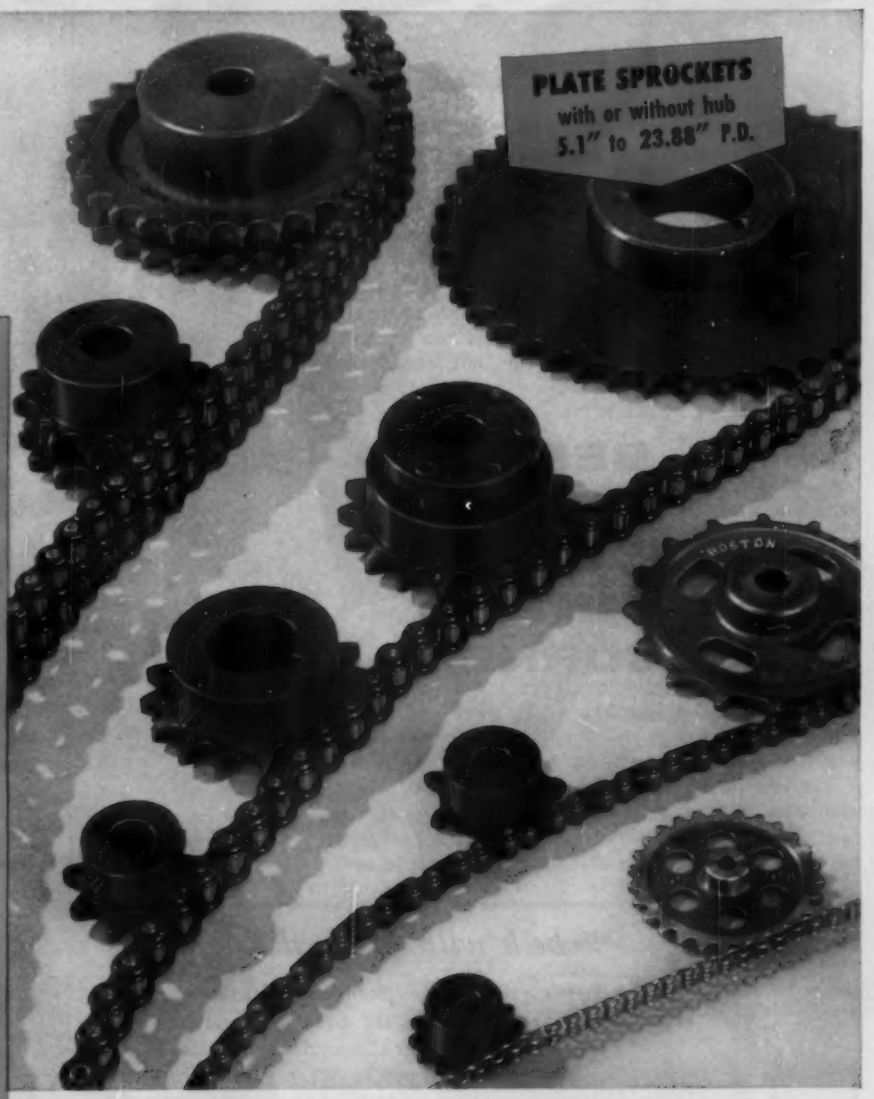
SPROCKETS, bronze and steel, for **LADDER CHAIN**

.185" to .353" P. **LADDER CHAIN** brass and steel

Save machining time

SHOLD-A-GRIP
interchangeable tapered **SPROCKETS and BUSHINGS**
2.09" to 23.88" P.D. SPROCKETS adaptable with tapered BUSHINGS to shaft sizes ½" to 3" by 16ths

BORED-TO-SIZE
ready-to-install **SPROCKET PINIONS**
Complete with keyway and setscrew. ⅜" through 1" P., in 76 tooth sizes, with 321 stock bores



You get BOSTON GEAR top-rated quality and lasting economy. You save time and expense when you buy from local stock — *at factory prices.* Be cost-wise — standardize. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

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For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

7124 "OFF-THE-SHELF" TRANSMISSION PRODUCTS **FROM STOCK** — AT FACTORY PRICES — ASK FOR CATALOG
Stock Gears • Sprockets and Chain • Speed Reducers • Bearings • Pillow Blocks • Couplings

. . . check with Milford Engineers!

Riveting raises *special* problems and requires *special* skills. You must have the right type and size rivet for each application, or the results can be costly . . . in production and in profits. When you're faced with a riveting problem, let Milford engineers lend a hand before designs are fixed!

To improve product appearance and strength
. . . to take full advantage of automatic assembly
. . . to cut delivery time and production costs
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ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

Free Literature

To order any of these bulletins, please use cards at start of this section—page 152c.

MACHINES AND ATTACHMENTS

30 DOUBLE ANGLE SHEARS—*Kling Brothers Engineering Works, 1320 N Kostner Ave, Chicago 51, Ill.* Bulletin DA-2345 describes multiple performance possible with two cutting sides in shearing of structural angles, bars, rounds, flats. Three latest models available illustrated; optional equipment and accessories listed.

31 C-FRAME PRESSES — *American Steel Foundries, Elmes Engineering Div, 1150 Tennessee Ave, Cincinnati 29, Ohio.* Illustrated bulletin 1015 covers hydraulic units for forcing, straightening, bending, forming.

32 RING AND CIRCLE SHEAR—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY.* Bulletin 70F Supplement 2 pictures and gives details on Model 33 RC with finger-tip control and power downfeed.

33 WHEEL APPROACH CONTROL—*Landis Tool Co, Waynesboro, Penna.* 4-page bulletin describes how control speeds grinding cycle on new Landis cylindrical grinders when work with large variations in stock has to be ground.

34 LIVE CENTERS—*Sturdimatic Tool Co, F St, Detroit, Mich.* 4-page bulletin 757 covers "Engineered" centers. Contains specifications and prices of standards which are made with Morse taper, also includes three types of specials.

TOOLS AND ACCESSORIES

35 VISES & WORKHOLDING FIXTURES—*Universal Vise & Tool Co, Parma, Mich.* 15-page catalog 9156 illustrates and describes features of Universal 3-way vise, precision lathe fixtures, rotary tables, mill vise, precision angle plate, workholders, parallel clamps.

36 PUNCHES AND DIES—*Acme Industrial Products, Inc, PO Box 468, Royal Oak, Mich.* 66-page catalog covers ball lock interchangeable punches and die buttons, retainer plates, die sections, diemakers' supplies. Includes technical data on die design and operation.

37 AUTOMATIC INDEXING X-RAY SPECTROGRAPH—*Philips Electronics, Inc, 750 S Fulton Ave, Mount Vernon, NY.* 8-page illustrated booklet contains detailed data on improved Norelco Autrometer, a non-destructive analytical tool. Materials of liquid, powder, or solid forms, including metal alloys, can be analyzed.

38 INDUSTRIAL AIR SPECIALTIES —*C A Claflin Co, 15 Hathaway St, Boston 10, Mass.* 12-page catalog 6 illustrates and describes air blow guns; spray guns for mold spraying, cleaning and other applications; safety chip gun; oil mist lubricator, air hose couplings.

39 INSTRUMENTATION TAPES — *Minnesota Mining & Manufacturing Co, 900 Bush St, St Paul, Minn.* 8-page illustrated booklet covers six types of Scotch brand magnetic tapes for use in machine tool control systems, computers, and other instrumentation applications. Charts list physical and magnetic properties of each.

40 TAP SELECTION—*Detroit Tap & Tool Co, 8615 E Eight Mile Rd, Warren, Mich.* 20-page booklet discusses proper taps for use on specific materials, such as

draws 5½" deep in one SMOOTH OPERATION!

RODGERS PLATEN PRESS forms 220 tackle box bottoms per hour with a single draw 5½" deep and retains the leather-grained embossed pattern without distortions or fractures.

Rodgers smooth acting, 100 Ton Platen Press with high speed circuit for fast approach and return of platen. Has upper knock-outs as well as pneumatic die cushion. Provides accurate clamping pressures to insure smooth, even draws.

This strong, lightweight, rust-proof and moisture-proof aluminum tackle box would delight the heart of the most finicky salt or fresh water fisherman—it's the new Model 1000, in the line of famous quality tackle boxes made by the UMCO Corporation of Minneapolis, Minnesota—"Land of 10,000 Lakes".

A Rodgers 100 Ton Platen Press was chosen by UMCO to draw their boxes because of its extremely smooth action and efficient operation. The entire box is formed in three operations—the bottom, which is 18" long, 9" wide, is drawn 5½" in depth—the top is formed in one draw and cut apart to form the two top halves—the carrier band, of 18 gauge aluminum, is also formed in a single operation. Material used in both top and bottom is 18 gauge, leather-grained, embossed aluminum.

It requires a really smooth operating press to make these deep draws and still retain the original embossed pattern and turn out top quality production without fractures or scrap—reason enough that UMCO selected a Rodgers Press to do the job.

Rodgers Platen Presses are offered in capacities ranging from 50 to 500 tons. Write for more information to suit your operations.

Light, rust and moisture-proof aluminum tackle box having 53 plastic lined compartments, by UMCO; a proud addition to any fisherman's gear.

Trim, neat, tightly enclosed, Model 1000 UMCO tackle box, designed to put the lift at the bottom—where it belongs.

Rodgers Hydraulic Inc.

7407 Walker Street
Minneapolis 26,
Minnesota

HI-PRESSURE Rodgers HYDRAULICS

problem: stop dust from causing health and morale problems.

problem: prevent dust from damaging costly precision machines.

answer: trap dust at its source with *unitized* Torit Dust Collectors.

Your workers are important . . . good personnel are becoming increasingly scarce. Portable, self-contained Torit units keep your employees healthy, satisfied and productive by collecting irritating dust. They protect your precision machines too—reduce costly maintenance and "down time." Many models and sizes available.

Free facts on dust problems and dust control. New 28 page, illustrated handbook is full of important, money-saving data. Contains charts, applications, details and specifications on all Torit equipment. Write today.

TORIT MANUFACTURING CO.
407 Walnut Street, St. Paul 2, Minn. Dept. 407

Free Literature

tough steels, cast iron, aluminum, zinc, brass, and plastics. Typical applications illustrated.

41 CYLINDRICAL GRINDING WHEELS—*Simonds Worden White Co, 1101 Negley Pl, Dayton 7, Ohio.* 4-page bulletin has specification table listing thickness and bore of all stock items with standard diameters from 12 to 36 in. Section on grinding hints and tips included.

42 OPTICAL SETTING OF WHEEL DRESSING DIAMONDS—*Hoglund Engineering & Mfg Co, 243 Snyder Ave, Berkeley Hts, NJ.* 4-page technical bulletin describes technique for pre-setting diamonds for use on contour wheel dressers. Illustrates how either pre-adjusted single or double diamond holders can be used to eliminate grinder downtime during diamond replacement.

HEAT-TREATING AND WELDING

43 GAS-FIRED MUFFLE FURNACES —*Surface Combustion Corp, 2375 Dorr St, Toledo 1, Ohio.* 4-page illustrated bulletin SC-179 discusses features of standard rated units. Includes applications for bright heat treatment and brazing of special steels and non-ferrous metals.

44 INDUSTRIAL BATCH OVENS — *Blue M Electric Co, 138th & Chatham St, Blue Island, Ill.* 4-page brochure 5510-A covers Power-O-Matic units with fully automatic proportional wattage control and temp range to 600 F with capacity from 16 to 96 cu ft. Also describes mechanical convection ovens with temps to 1200 F.

45 SPOT WELDERS—*Sisler Engineering Co, 750 S 13th St, Newark 3, NJ.* 16-page catalog illustrates and describes complete line of equipment.

46 SEMI-CONDUCTOR SOLDERING DATA—*Anchor Metal Co, 966 Mecker Ave, Brooklyn 22, NY.* Reference chart offers phase diagrams for Anchor soldering alloys used in semi-conductors. Includes list of high-purity elements available.

PARTS AND MATERIALS

47 BLIND BOLTS—*Hi-Shear Rivet Tool Co, 2600 W 247th St, Torrance, Calif.* 8-page brochure details advantages of blind bolts and nuts, structural and repair applications, design characteristics, tools and guns, installation techniques and hydraulic power units for driving bolts.

48 FLEXIBLE CUSHION COUPLING —*Dodge Manufacturing Corp, Mishawaka, Ind.* 12-page illustrated bulletin A-669 describes Para-flex; explains how coupling accommodates angular misalignment, parallel misalignment and end float, singly or in any combination, besides cushioning shock loads and diminishing torsional vibration. Tabular engineering data aid selection.

49 MOTOR CONTROL—*Allis-Chalmers Manufacturing Co, Milwaukee1, Wis.* 8-page bulletin 14B8507 covers design features of front access, high voltage starters (Type H) for 2300 to 5000-v motors.

50 PRECISION INTERVAL TIMERS —*A W Haydon Co, Waterbury, Conn.* Bulletin AWH-RC-300 covers new series available with either chronometrically governed dc motors or synchronous ac motors. Includes charts on typical ranges, provides outline and mounting dimensions, describes operations and features.

51 HARD-FACING ALLOYS—*Haynes Stellite Co, Div of Union Carbide Corp, 30-20 Thompson Ave, Long Island City 1, NY.* 8-page booklet describes chemical composition, some properties, typical applications and application procedures for 11 Haynes alloys available as bare rods, crushed particles, and powder.

52 PRECISION INSTRUMENT COMPONENTS—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, NY.* 64-page supplement catalog No. 13 lists over 2000 additional components, such as 24 to 200 pitch spur gears, Precision II stock gears, anti-backlash gears, couplings.

53 RESIDUAL STRESSES IN COLD FINISHED STEEL BARS—*LaSalle Steel Co, 1420 150th St, Hammond, Ind.* 32-page data book 16 discusses stresses in cold drawn, ground, turned, and heat-treated steels; data on fatigue, cracking, machinability, tolerances, and corrosion included.

54 CKL BLIND RIVET—*Huck Manufacturing Co, 2480 Bellevue Ave, Detroit 7, Mich.* 16-page illustrated catalog describes Conical Keystone Lock unit. Covers driving procedure, dimensional data and specifications for complete line including standard diameter in both brazier head and countersunk head types, as well as oversize diameter countersunk head type.

55 STAINLESS STEEL SPECS CHART —*Peter A Frasse & Co, 17 Grand St, New York 13, NY.* File-card-size chart shows chemical analysis requirements for most frequently used government specifications. Lists specified forms (bars, wire, etc), and nearest corresponding SAE, AISI and AMS type numbers.

56 MECHANICAL RUBBER — *Henry Engineering Co, Moline, Ill.* 24-page illustrated booklet describes bonding of molded mechanical rubber to metal (including aluminum), compounding of rubber, and uses of metals when cushioned with rubber where metal-on-metal cannot be used.

57 SELF-LOCKING CONNECTORS — *Avnet Interlock Sales Corp, 36 N Moore St, New York 13, NY.* 24-page catalog illustrates and describes the Hubbell Interlock line. Features and specifications included.

58 TUBING STEELS—*Babcock & Wilcox Co, Beaver Falls, Penna.* Technical Data Card TDC-153B presents stress rupture data on a number of tubing steels used at elevated temperatures and pressures. Furnishes results of tests on 14 steels including carbon steel, several alloy steels and 10 different stainless steels. Testing temps range from 850 through 1800 F.

Round Table

BEAT—ON HIS OWN TIME

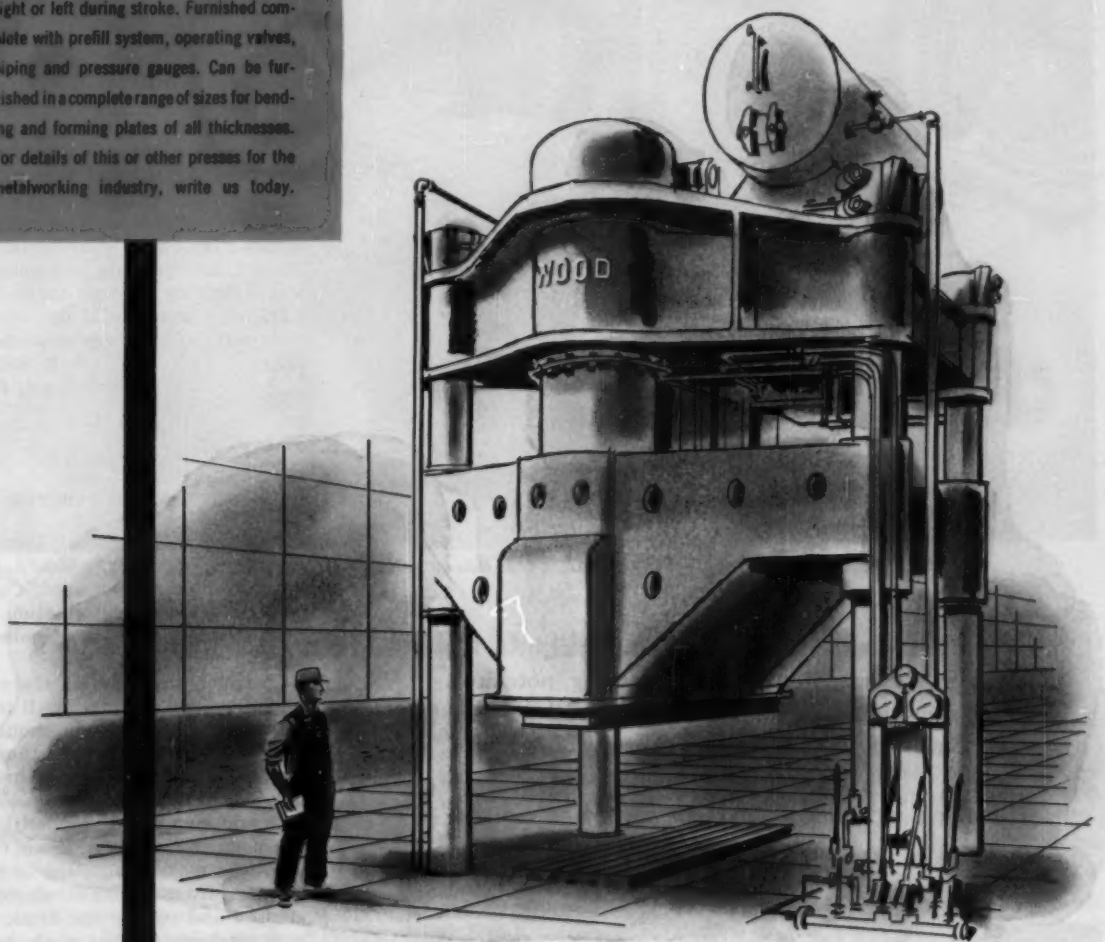
Has the company any say in whether a worker takes on a part-time job at night? If his daytime performance is satisfactory, can there be any legitimate complaint?

MANY EMPLOYEES have hobbies and spend hours of their spare time on them. Many of these hobbies are such that require physical action. It does not necessarily affect their regular job, as they like what they are doing. When they like a hobby

1500-ton Heavy-Duty Forming Press for bending and forming operations on heavy steel plate. Moving platen can be tilted right or left during stroke. Furnished complete with prefill system, operating valves, piping and pressure gauges. Can be furnished in a complete range of sizes for bending and forming plates of all thicknesses. For details of this or other presses for the metalworking industry, write us today.

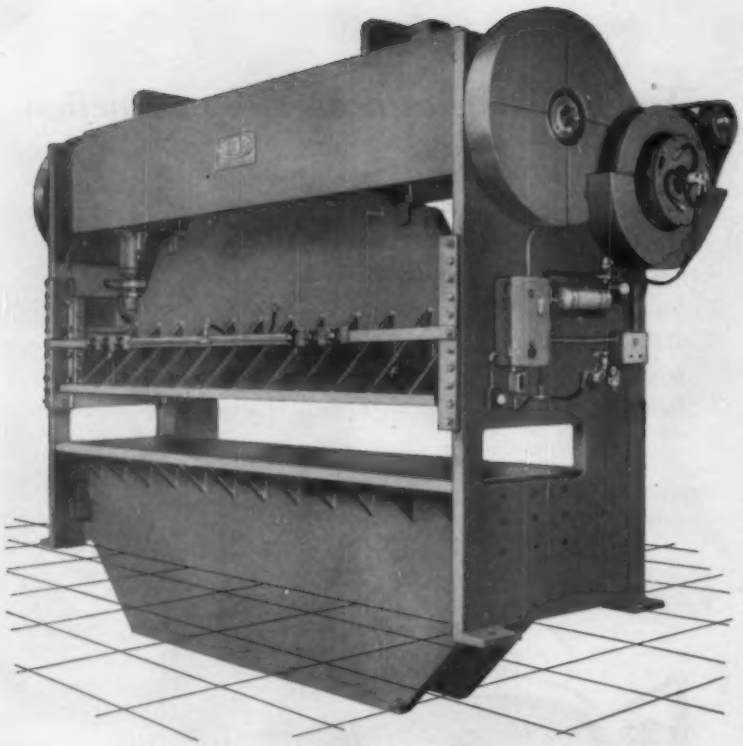
You'll like what it does to production

It's just plain common sense—when your down-time decreases your production is bound to increase. Down-time can't be eliminated, but R. D. Wood Presses hold it to a minimum. The sound design, choice materials and careful craftsmanship that go into a Wood Press produce a superior product—a dependable, smooth-working press that can't help but increase production records. Write for our catalog and engineering information—no obligation.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA



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PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

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CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

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MANUFACTURING CO.
7434 South Loomis Boulevard, Chicago 36, Illinois

it is a form of relaxation. Other people are active in sports in their spare time. Then we have the barflies who spend all their spare time in a tap room and drink all night long. Most of these people have good attendance records and do a good day's work. Even the so-called mountain goat who drinks anything and everything he can find manages to give a good day's work.

There is no secret about these various activities and the company does not interfere with a man's freedom after work. Why then should the company try to order a man to quit a spare-time job? If the employee was doing sloppy work I could understand the boss complaining. If the employee was doing a bad job we would get rid of him regardless of the reason. There are of course some types of work of a confidential nature. If an employee was doing spare-time work for a competitor they would have some complaint.

In any case the company cannot order the man to quit a spare-time job. They can suggest that he quit the other job. The power of suggestion will often get favorable response. It's the bleary-eyed late starters, late arrivals, and absentees with whom we must get tough. First, a friendly warning; if no improvement, put the employee on probation.

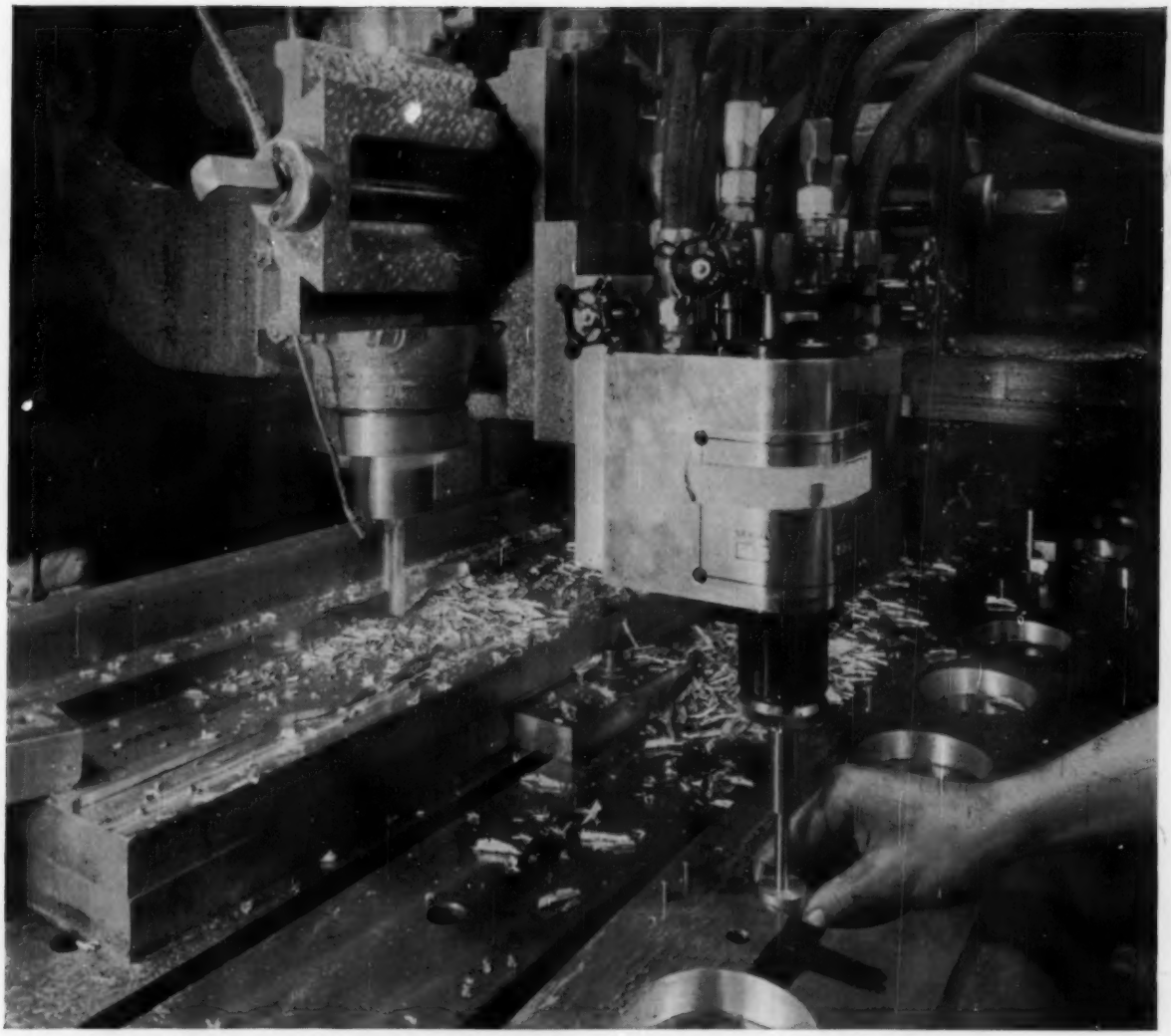
A E Salmons
Norristown, Penna

REFERENCE CORNER

Would a small technical library be useful in the shop? Would it be abused, or simply not used? Can the men get sufficient information from their own or a foreman's handbooks?

If properly run, and if there is a likely demand for it, a small technical library for the shops should not be a waste of time, as Ed thinks. If the shop personnel is technically minded, or if a sizable minority is, it should be a paying proposition for the company and for those of the men who make proper use of it.

Apart from technical classes organized and run by the firms, there is in most engineering works here in Scotland, a goodly number of the younger employees attending technical college evening classes in their spare time. A technical library for the shops would most certainly be used and appreciated by them. Those youths who spend their leisure hours on what is here called "further education," in pursuit of



TRACING STYLUS (right) being used on highly accurate magnesium template in profiling operation at American Tapered Wings, Inc.

"Low cost, easy to handle magnesium is an ideal choice for our profile templates"

"We first began using magnesium tooling plate in February, 1956," reports Harold Redpath, Executive V.P. of American Tapered Wings, Inc., Los Angeles.

"We found it entirely practical from the standpoint of strength, and it is lighter, easier to handle and less expensive than either aluminum or steel . . . permits individual workers to move units without using overhead cranes or fork lifts. We used about 7,000 lbs. of magnesium in 1956, saving about $2,000 in tooling metal costs.

"We have been using many of our magnesium templates nine months to a year, profiling aluminum forgings which serve as wing spars, vertical fin spars and longerons. We also use magnesium tooling plate for making many of our drill jigs and milling fixtures."

For more information on low cost, lightweight, easily machined magnesium tooling plate, contact your nearest supplier of Dow magnesium. Or write to THE DOW CHEMICAL COMPANY, Midland, Mich., Department MA 14204.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. Reliance Magnesium Co., Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

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BUHR

a world's leading manufacturer of multiple-spindle high production machinery like this...

the record . . .

Since 1912, Buhr has grown steadily to its present position as a world leader in the manufacture of special automation machinery.

Wherever special metal-working machinery is purchased, BUHR ECONOMATICS are well-known for Quality and Performance.

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ANN ARBOR, MICHIGAN
Solidly Engineered • Precision Built • for World's Leading Manufacturers

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ACQUIRES SIDNEY

assumes full control of producing one of the nation's finest lines of precision heavy-duty metal working lathes...

BUHR plans at SIDNEY...

1 **continue the present line** of Sidney engine and precision toolroom lathes, as well as the Sidney Fluid Tracer in the conventional- and universal-type.

2 **expand the Sidney line** to cover a wider range of sizes and applications.

3 **increase manufacturing facilities** to integrate production and assure better delivery.

4 **merchandise Sidney Lathes** with the same aggressiveness which has characterized the selling efforts of the Buhr organization.

SIDNEY... a fine name in lathes... will be even FINER!

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SIDNEY MACHINE TOOL CO.

SIDNEY, OHIO

Wholly-Owned Subsidiary of Buhr Machine Tool Co.

• universal

Type 631-BL
STROBOTAC®

Range: 600-14,400 rpm direct reading, useful from 60-100,000 rpm.

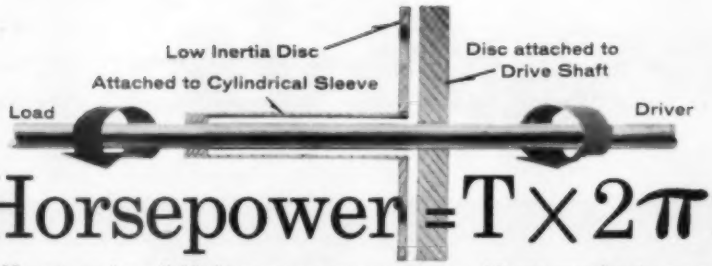
Accuracy: ±1% of dial reading over most of the range.

Flash Duration: 10-40μsec.

Power: Operates from normal 115v, 60-cycle lines.

Portability: 7⅞ x 9 x 10 inches, 9½ lbs.

$160.



Horsepower = T × 2πn

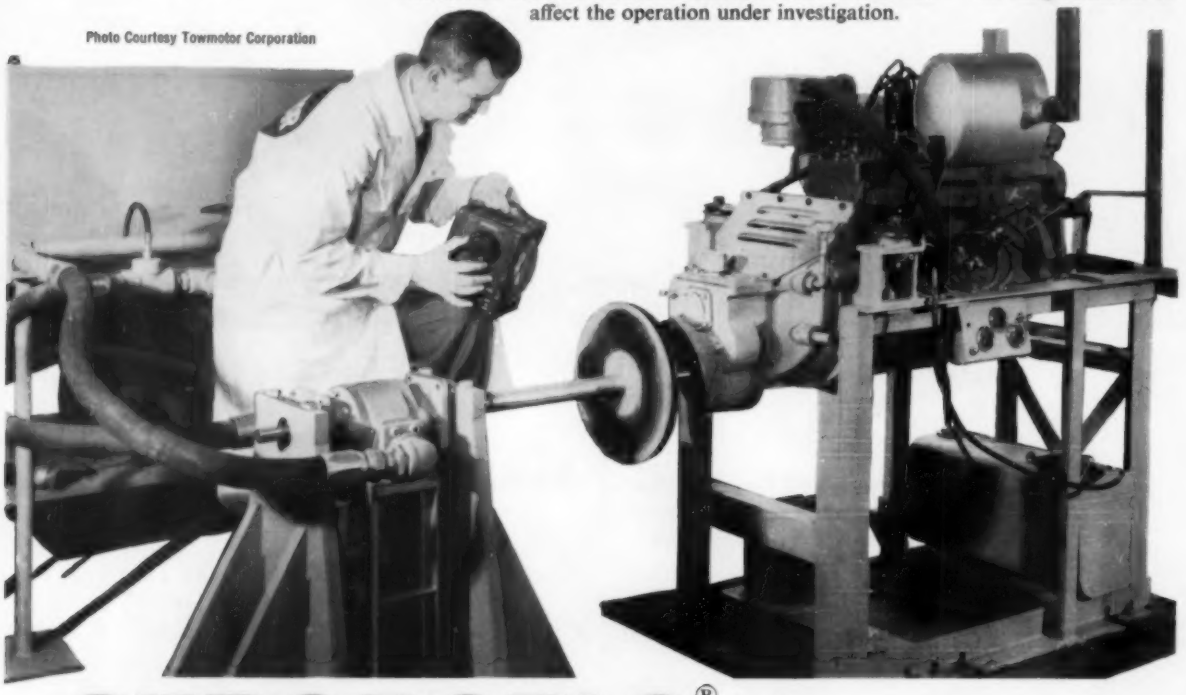
How to make reliable horsepower measurements without resorting to expensive equipment? This is a problem that confronts many engineers. The Towmotor Corporation of Cleveland utilizes a fundamental physical principle and the G-R Strobotac to perform this work.

Measurement of engine horsepower is accomplished with a hydraulic power-absorption stand and the G-R Strobotac. Fitted concentrically over a drive shaft is a cylindrical sleeve that has a low-inertia disc at one end and is attached to the drive shaft at the other end (see sketch). Parallel to the low-inertia disc and securely connected to the drive shaft is another disc.

When the driver is operating, the drive shaft twists and there is a relative displacement between the two discs that is proportional to the TORQUE applied. However, since the whole assembly is whirling around, little can be seen. It is necessary to "stop" the motion to determine the displacement — this is done accurately and conveniently with stroboscopic light, supplied by the Strobotac. This instrument simultaneously gives the SPEED of the rotating shaft on its calibrated dial. Since HORSEPOWER is proportional to the product of TORQUE and SPEED, the job is done.

The G-R Strobotac is ideally suited for this type of work or, for that matter, for *any* measurement of speed of rotating, reciprocating, or other cyclic motion. The instrument is an ideal design, production, or maintenance tool. Its high-intensity, short-duration pulses of light "freeze" rapidly moving parts or processes, making possible detailed examination of the action while at full speed. There is no physical connection between Strobotac and the device under test — no drag whatever to affect the operation under investigation.

Photo Courtesy Towmotor Corporation



STROBOTAC®

Manufactured Exclusively by

GENERAL RADIO Company 275 Massachusetts Ave., Cambridge 39, Mass.

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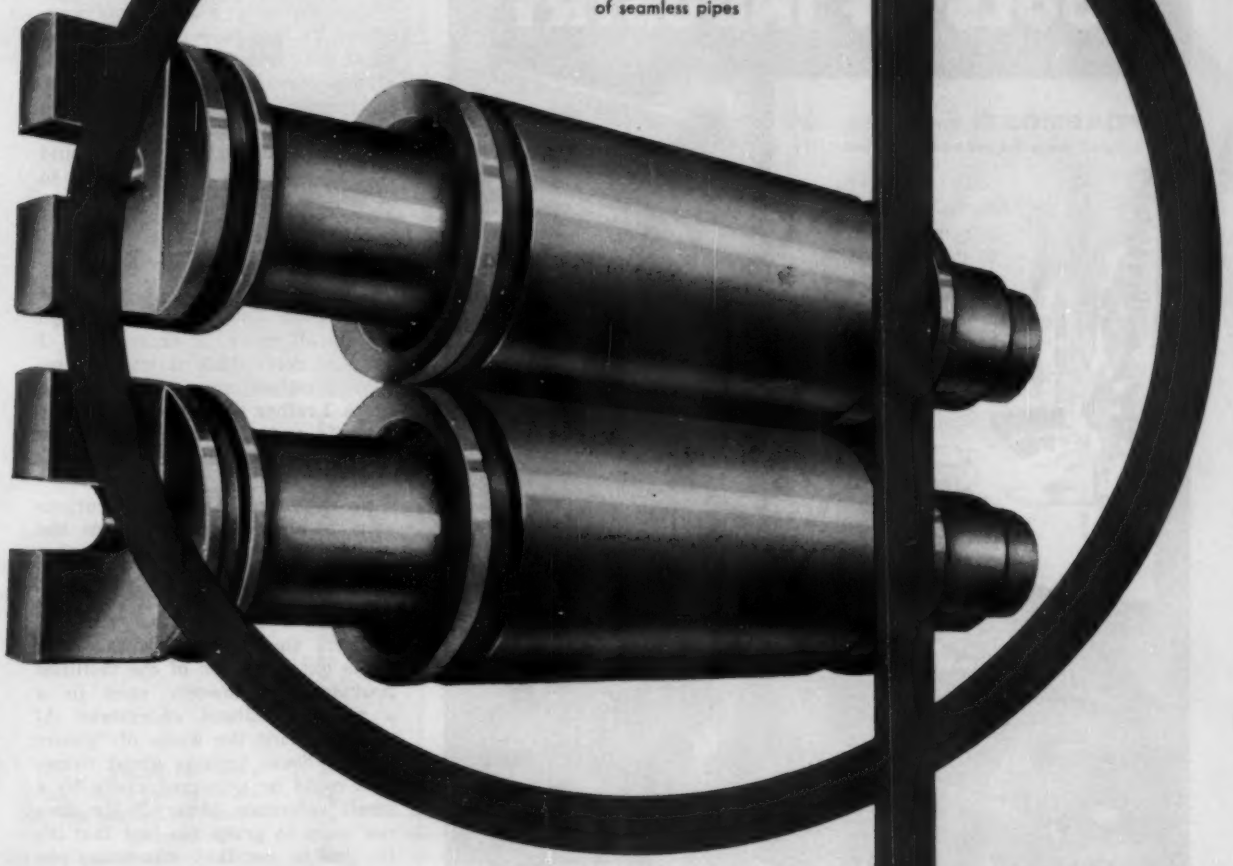
All G-R Products are now covered by a *2-Year Warranty*

- universal milling and boring machine with movable table and movable column
- single, double and triple action hydraulic and mechanical presses

blooming mills •
hot and cold Sendzimir mills •
electric furnace •
continuous casting mills •
hot ingot peeling machines •
complete rolling mills •
complete mills for the production of seamless pipes •



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works in milan (Italy)

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TOOLS OF INDUSTRY

FOREMOST! Since...Niagara's power was harnessed for Industry.

1895 saw the first commercial transmission of Niagara's electric power. With unlimited power available, a new industrial age of high production, precision machining was born.

Since 1882, Williams has anticipated the tool requirements of manufacturers with a complete line of holders for turning, boring, threading, knurling, planing, shaping, cutting-off and side work. A full line of high speed and carbide cutters and set-up accessories is also available.

You get quickest delivery at lowest cost from your LOCAL DISTRIBUTOR.

Williams makes the broadest line of its kind. Write for Catalog 302.

J. H. **WILLIAMS** & CO.

BUFFALO • NEW YORK • CHICAGO • LOS ANGELES

knowledge calculated to further their ambitions in life, are the cream of the shops and richly deserve all the encouragement that can be given them.

In all shops there are men who have no taste for study. On those employees, a technical reference library would be just wasted. I don't think the scheme could be properly run by anyone as a spare-time occupation. To be a success, it would demand the supervision of an interested and competent man who would be permanently located there. It would, in many shops, not be a full-time job and arrangements would have to be made for "fill-in" work to be provided.

Although I favor the proposal, I don't share Al's optimistic view that a technical library for the shops would be a time-saver. I believe it would be a time-consumer, though not in all cases, a time-waster. I likewise don't think it would "prevent pointless arguments" in the shops. I rather think it would do the opposite and that might not be all to the bad, provided they were not too prolonged.

To my mind, Al takes a curious view of the scheme. It seems the wrong approach to suggest that workers might be allowed to use the library "once in a while." If it is to to serve a really useful purpose, workers should be encouraged to make extensive use of the facilities provided, not merely once in a a while. I cannot understand Al countenancing the waste of "plenty of man-hours arguing about things that could be answered easily by a small reference library." He does not seem to grasp the fact that it's his job to see that man-hours are

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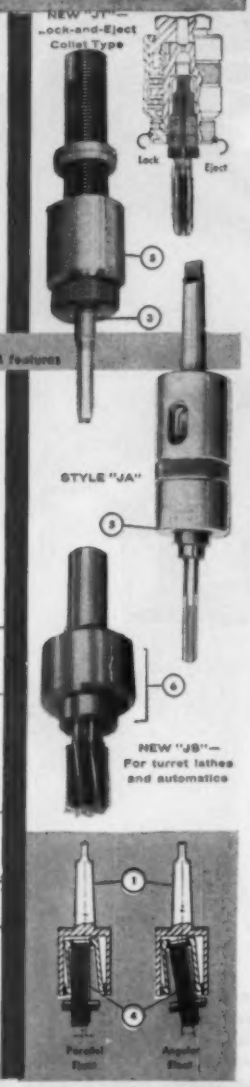

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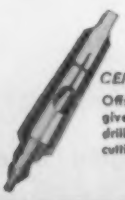

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Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

profitably used—not wasted. Ed's fear that some of the men would regard the provision of a shop library as an official invitation to spend an odd half tour on easy street is not very wide of the mark and would have to be guarded against.

The artful dodgers would be discouraged if a full-time librarian was employed. An elderly detail draftsman or a male tracer would suit. Either could carry on with their skilled job and cast an eye over the library habitues, with a lingering glance on those who were obviously swinging the lead.

It is desirable that the one in charge should have an interest in and a knowledge of technical publications. To let the proposed library run itself would be unforgivable folly, in a short time it would be reduced to chaos. I don't attach much importance to Ed's suggestion that even if they did have a library, a lot of foremen wouldn't let their men have time off to use it, in spite of company permission. If the scheme had company backing, why should the foremen object? They have the remedy in their own hands if they suspect any of their men are not playing the game.

In all cases, the foreman should be notified by intending users on their way to and from the library and if faking is resorted to, the librarian should be asked to quietly time the suspects and to generally observe their conduct. Frequent and lengthy absence should be censured by the foreman. Repetition should be reported upwards for investigation, top level investigation. That procedure would clear the foreman and keep the "toppers" in touch

"Why, the last place I worked for didn't want me to leave."

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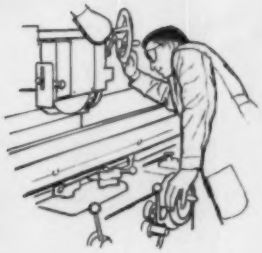

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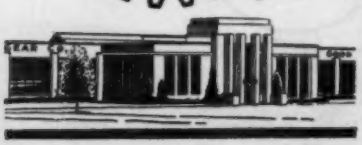

with the points, for and against, the library scheme. A foreman giving proof of loss of production, due to library loitering, must be taken notice of by his chief, but only a few black sheep need not mean the breakdown of the scheme. The few work-shysters can be effectively dealt with and prevented from wrecking a progressive and enlightened idea, provided the firm, the foremen, and a reasonable proportion of the shop personnel are keen and anxious to make a go of it. I think it's a good idea that could well catch on, given proper supervision and a sense of responsibility at all levels.

J C Ball
Stranraer, Scotland

A SMALL technical library would not be a useless addition for the shops, provided it was used intelligently. It could be a worthwhile investment, but I'm inclined to agree with Ed, it would not be sufficiently or intelligently used to justify the expense and it could more likely than not become an excellent lounge for the work-shy and perpetually tired. If the engineering section, which will include draughtsmen, do their work properly, there should be no need for a shop technical library, small or large. The engineering section, which in most works includes design, is the reference library. That is the arrangement here in Britain where, in addition, the shop foreman must have a certain standard of elementary technical knowledge.

Most of the shop foremen own a few handbooks and textbooks which see them over the day-to-day problems. That includes the men's problems and if any of them get stuck, the rule is "see your foreman." That way cuts out all possibility of, or excuse for "wasted man - hours, arguing about things that could be answered easily by a small library." If valuable time is not to be wasted, snags should immediately be referred to the shop foreman concerned. He is, or ought to be the one person most concerned to see to it that time in the shop is not wasted. If the problem is highly technical and rather beyond the foreman, he takes it to the engineering department where the answer is usually forthcoming with a minimum of delay.

Of course, there should be no technical problems in the shops for the shopman or foremen to solve. All that work should be handled in the

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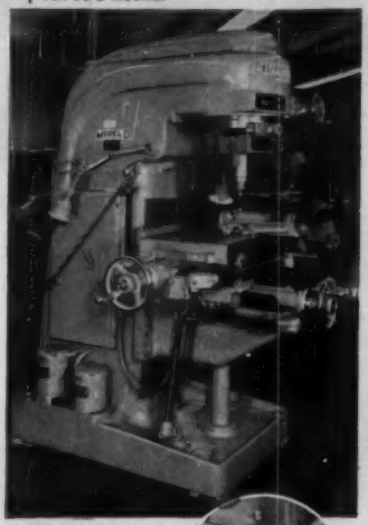

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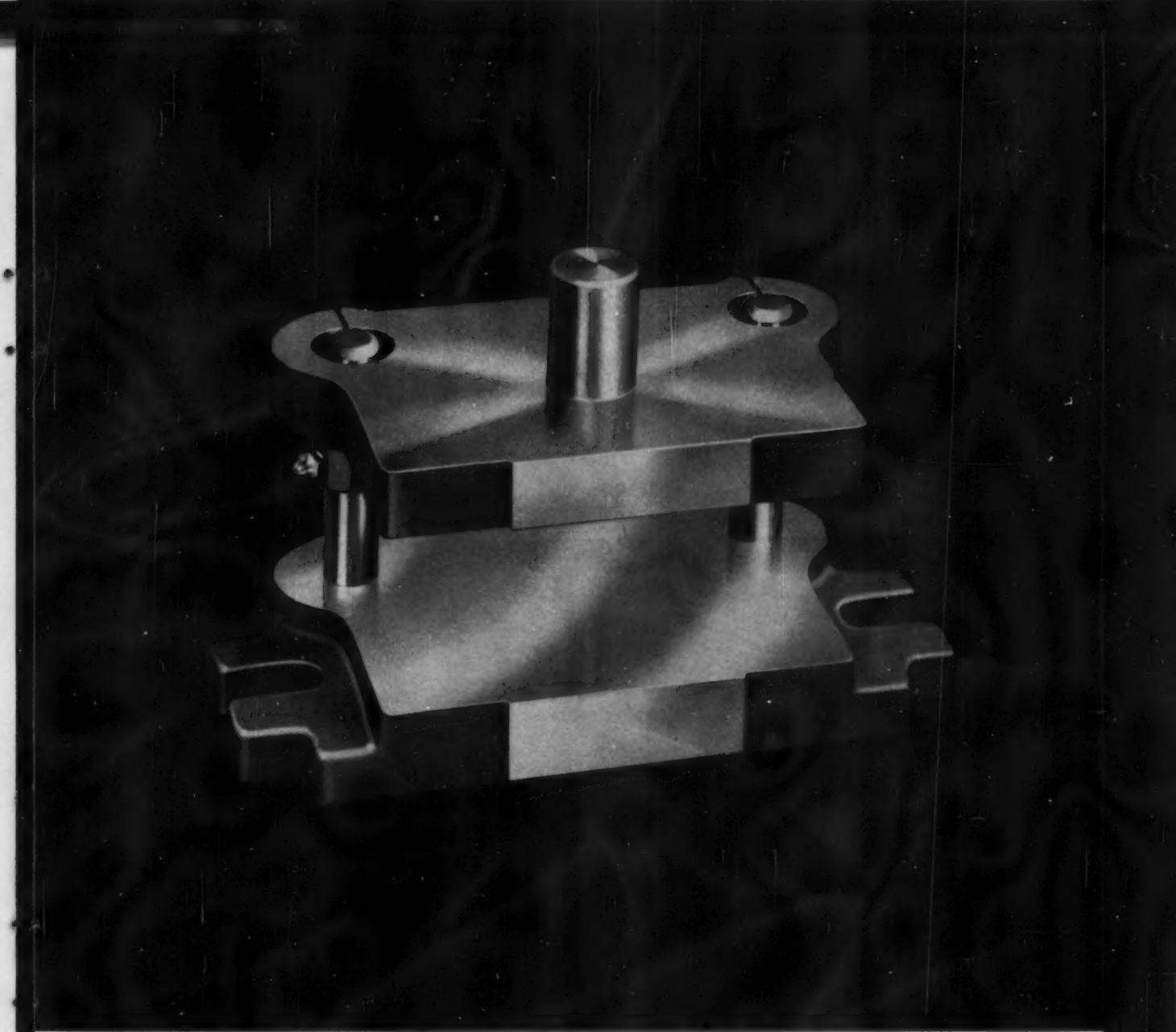
engineering department and should be seen on shop drawings as lucid, straightforward information that most of the men can understand and all of the foremen assuredly will. If shop drawings don't make every phase of the manufacturing process crystal clear to all who have occasion to use them, then they are bad shop drawings and the engineering department should be called to account. In addition to the foregoing, all general engineering plants over here employ one or two highly skilled men engaged on marking off, i.e., lining out rough material to indicate the amount of stock to be removed by machining.

Broadly speaking, that provision relieves the machinists of the responsibility of interpreting shop drawings. Those "markers off" keep a little "black book" in which are entered all the snags pertaining to machining, fitting, assembly and erecting. It is a fount of knowledge freely at the disposal of all. Those men who are employed in lining out parts to be machined, frequently are draughtsmen who have served a drawing office apprenticeship at the board and prefer shop to office work. The great majority of them have had many sessions of evening class work at technical college and are familiar with reading and working to arrangement and detail drawings.

They are mostly young men who eventually become shop foremen, supers, and managers, and are qualified to answer all shop queries concerning machining, fitting, assembly and erection, and so relieve the foreman of much of the question and answer work that may arise. That is a much speedier way of dealing with difficulties than leaving the person, or persons who are in doubt

(Continued on page 194)

"May I have a word with you, Jackson?"



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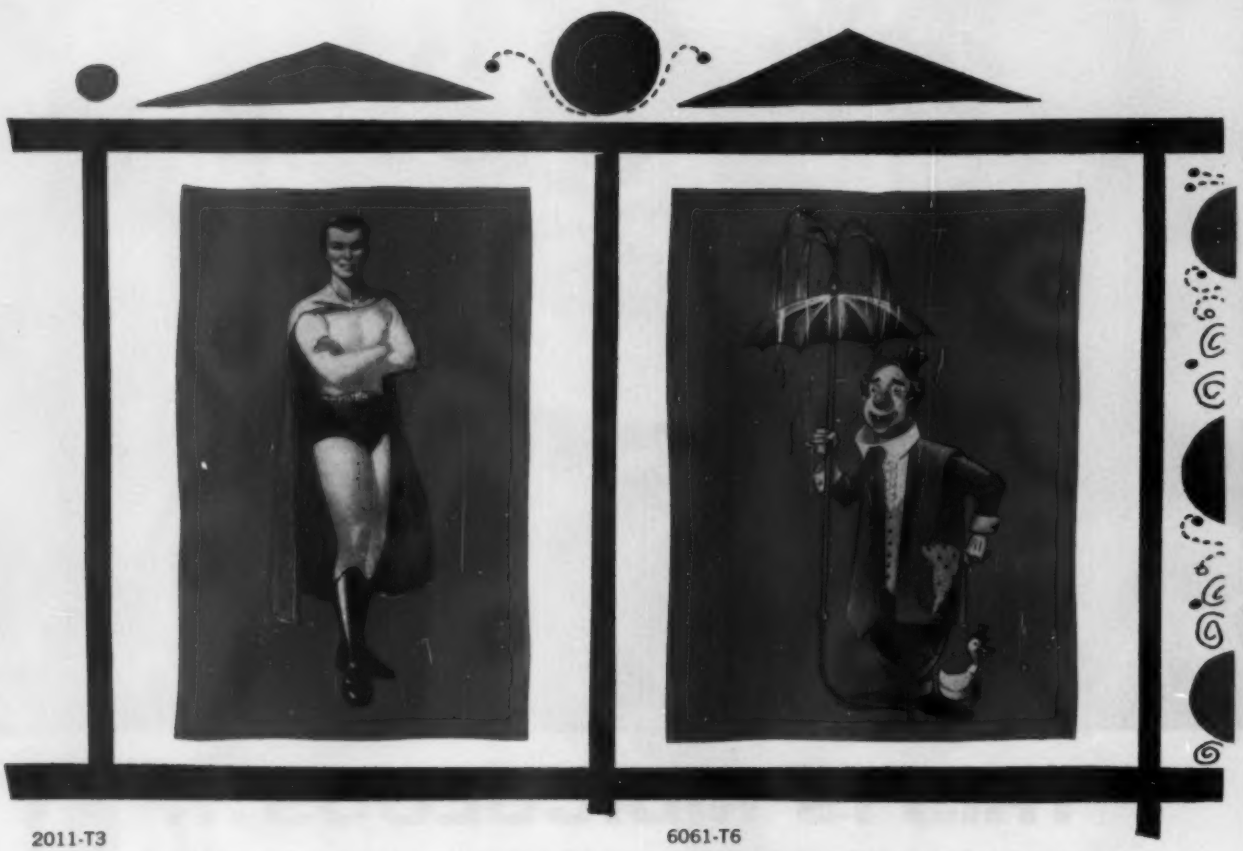

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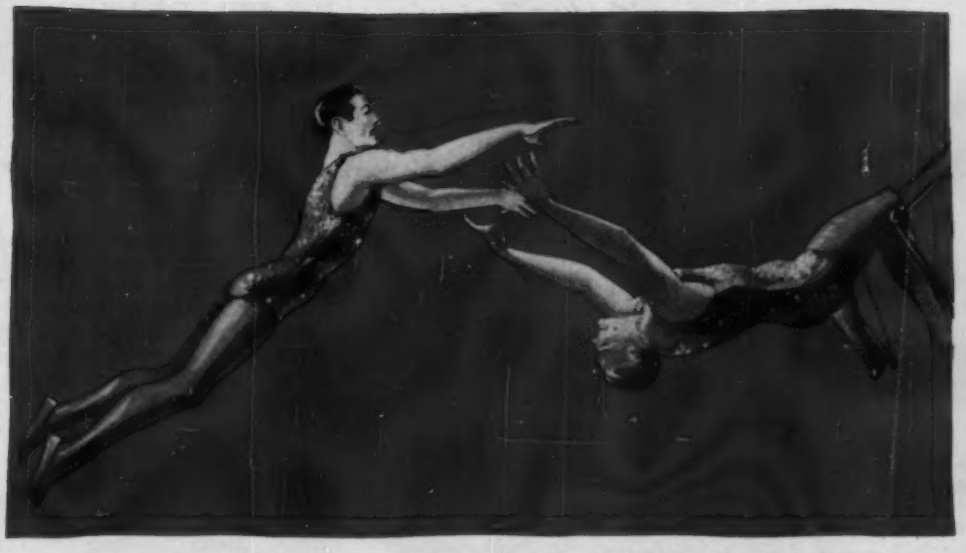

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to wade through a mass of information, however valuable, in a shop library. It isn't difficult to imagine, say, a grinder having an unusual alloy to machine, being in doubt as to the correct wheel to use. He consults a nearby grinder, only to find their ideas don't coincide. A third grinder is called in with no better results and, finally, all three adjourn to the shop reference library where they spend an appreciable slice of an afternoon in agreeable disagreement.

If the shop foreman is appealed to and doesn't know the answer, he is sure to find that the engineering department has a grinding wheel catalogue with all the information required. How much simpler, how much more economical of time, to have approached the "marker off" or the shop foreman in the first instance. To me, Al seems engagingly optimistic about the success of the small technical library. Has he, I wonder, forgotten about the fate of most suggestion-box schemes? The first lush weeks when men lived laborious days putting their pet schemes on paper, in the hope that their brain child might startle the judges and revitalize the nerve center of industrial production, the gradual slowing down of the offerings, the beginning of the end.

This is not a tilt at suggestion schemes which I favor and foster to the limit, but I have so often to deplore the lack of staying power in those on whom the success of the venture depends. I hate to be a Jonah, but I rather share Ed's view of this matter. Unless the library scheme was carried through in the grand manner with a competent and interested librarian in charge, I'd hesitate to prophesy a long and useful life for it. I doubt if Al really believes the men could be trusted to return books to their respective racks when finished with only

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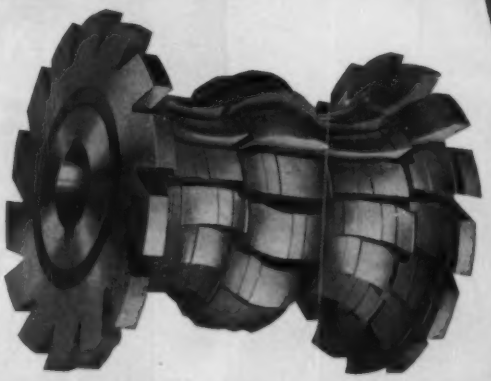

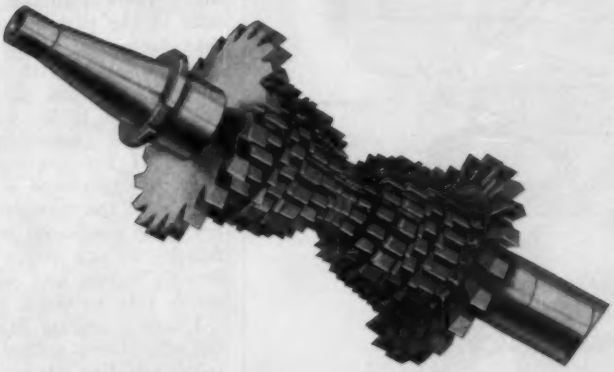

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"someone in the office keeping an eye on it." Some few might, but I fear, without someone permanently and authoritatively in charge, more time would be lost looking for the right book than would be saved by the finder.

I feel certain that, at best, the results would never justify the expense of a qualified librarian, and with a good engineering department to turn to, Al's shop library is very much like the third wheel to a cart.

C Mackinnon
Lanarkshire, Scotland

I FIRMLY believe that public libraries are one of our most effective elements in adult education. They are the source of desired information—where a person, who is hungry for facts, can secure them at his convenience.

Being an industralist at heart of many years' standing, I have taken note of the part efficiency plays in manufacturing. While I have no bones to pick with so-called educators and formal education in general, I came to the conclusion that there was something decidedly wrong. I am convinced by many years of experience as an instructor that were the manufacturing industry to be conducted with such inefficiency we as a nation would still be driving horses and wagons. I have never seen so much waste of time.

I cannot impute this condition to the educational authorities alone because effective education consists in the cooperation of four basic elements: qualified instructors, pupils, parents, and last but not least by

"I guess that's what is meant when they say, THE JIG IS UP!"

any means, the cooperative interest shown by the public.

Were pupils fired with the desire to learn as is a worker in industry who desires to learn some facts, education would become considerably more effective. Were parents more cooperative with school authorities instead of pampering their children and laying the blame on the teachers for their children's low grades, more progress would ensue. Industry hasn't taken enough interest in education to insist that the potential employees be properly trained.

With this thought in mind I give voice to my approval of Al's recommendation; my native English response gives out with a "Heah—heah!" I do not, however, approve of workers running to a central source for information anytime they so desire. I would limit this privilege to noon hours, breaks, or before and after working hours. If any reference is desired to facilitate one's work, then the foreman's approval should be imposed.

I have digressed a little from the subject—reference corner—but what I am striving to stress is that a reference center, to which one can go to secure information relative to some practical application is, in my humble opinion, conducive to the maximum efficiency in real learning—learning where what is learned is indelibly engraved in the subconscious as a potential for further use.

True it is, as Ed said, that one should have his own handbook to refer to now and then—especially the *American Machinist* and Machinery handbooks which are invaluable in machine shops or toolrooms. These should be studied thoroughly so that one may be acquainted with their contents. Here is effective education wherein no time is thrown to the wind.

I would have a thoroughly trained man at the head of Al's suggested plant library—one who has a broad formal education. Equip him with the Reader's Guide which is kept up to date and have him show the go-getter how to dig up the information he is after.

You need to watch your step, Al, in making things available for those people who delight in settling arguments. We have people who are so adept at this thing that they can easily argue their mother-in-law out of her upper plate or, more to the point, argue their employers out of valuable time. Arguments are an abomination.

And what Ed says about inviting men to loaf for half an hour isn't poppycock. Don't have an open sea-

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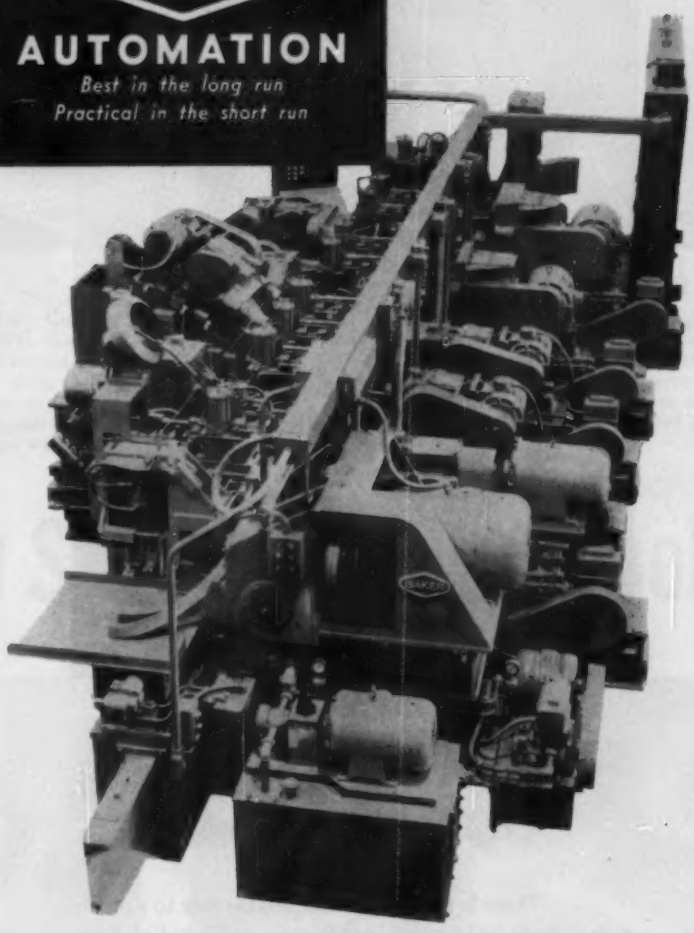

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Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

son for killing the interest of production by making a plant library available at any time for anyone. Have it regulated so as to make such a pastime impossible.

And, Ed, my friend, your idea of having the fellows borrow handbooks is out, from my viewpoint. I don't believe in encouraging moochers and believe me, there are plenty of them in the shops about the country. Every bonafide worker should have his own handbook and know it thoroughly so as to save time in gaining information.

As an emphatic windup may I suggest that a shop library is a sound investment if properly supervised and its use limited to those authorized to its access during working hours. I'm for it 110%.

J Homewood
Laguna Beach, Calif

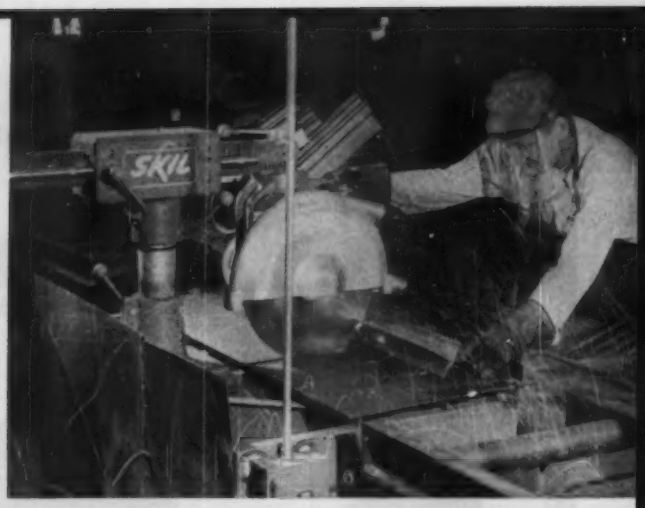
A TECHNICAL LIBRARY run by a company is one of the best ways to insure better future employees. These libraries should include material on many phases of engineering, technical data on processing, foremanship and management. In other words, a well-rounded library will make for a well-rounded company employee. True enough, not all peope will use the library. Probably those who need it most will be the ones who will shun it. Usually their thinking is "if it is supplied by the company for our advancement in knowledge, something has to be wrong with it."

It is surprising the interest expressed by the average employee if given an opportunity to choose the books he likes. We have found men who are machinists interested in chemistry and other technical fields

"I hate a man who can't take constructive criticism about his work!"

Saves 30% time

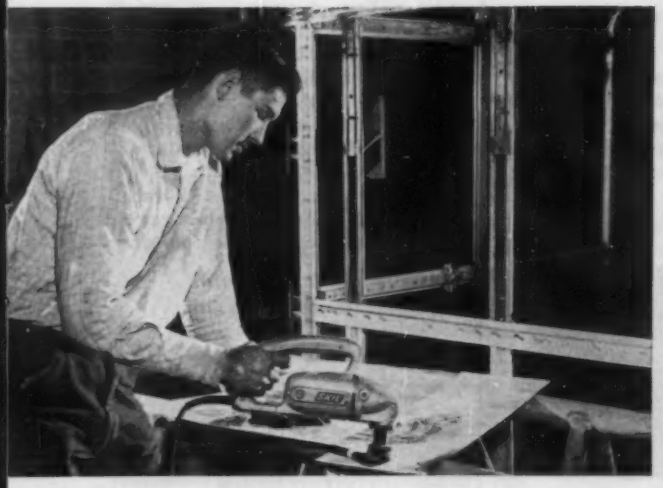
The Columbus Heating & Ventilating Co., Columbus, Ohio, owns an all-around inventory of SKIL tools. The reason: practically no maintenance, light-weight, better balance, adaptability. Mr. Clarence Fine, shop foreman, singled out the SKIL Model 825 Disc Sander as a tool that stands up under continuous operation. "In addition", says Mr. Fine, "it's 30% faster than anything else we've tried."



Saves 8 hours labor costs a week

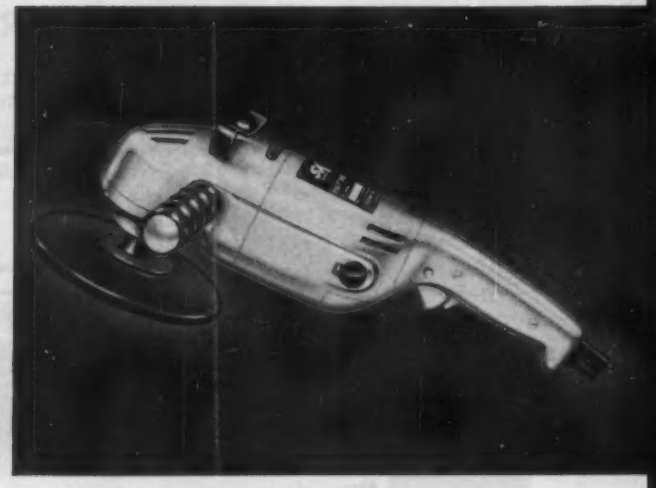
Five years ago, Trailmobile, Inc., Cincinnati, bought a SKIL Model 450 Radial Saw. Since that time four more such saws have been added with these results: "Each one saves us one 8 hour day labor costs per week", says Mr. Herman Suter, portable tool supervisor. "We have eliminated the sanding operation of rough edges caused by a cutting torch."

It's true! You SAVE with SKIL Tools



Saves $100.00 per week

"Our new SKIL Shear paid for itself in the first week", says J. M. McLain, owner of J. M. McLain & Sons Trailer Company, Houston. "In using other makes of shears we found that maintenance costs were about to run us out of business. Some operations were cut from 30 minutes to 1½ minutes. My men like SKIL shears because they are easier to handle, adaptable, and are cheaper to run."



YOU, TOO, CAN SAVE

NEW! SKIL 7" Model 852 Disc Sander. Save time and effort on the toughest sanding, wire brushing, grinding. New, powerful motor stands up under the heaviest work load. No matter what you have to sand, grind, saw or drill, there's a SKIL tool that can do the job better, faster, cheaper. Ask your SKIL distributor to show you why. Or use the coupon below for further information.

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_____ Please send me name of nearest distributor.

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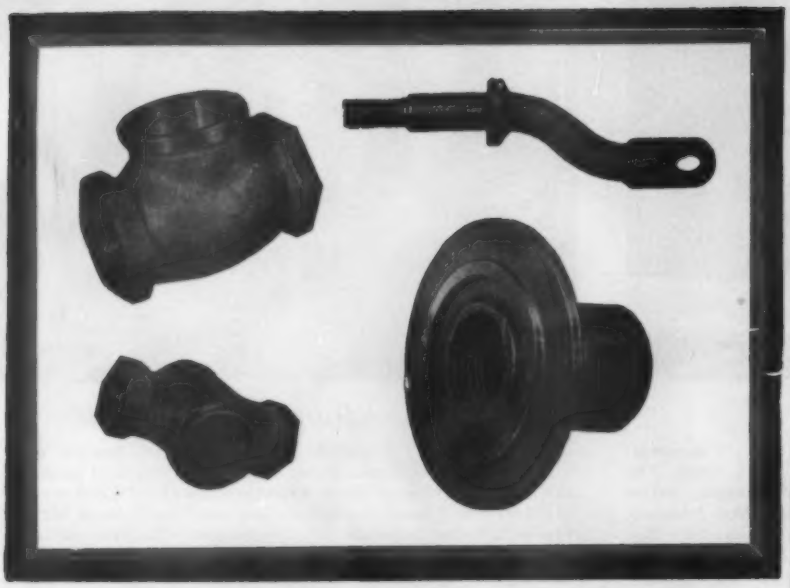
far distant from their everyday work. This indicates that a library must not dictate what shall be read but rather a "Here are the books—you select those of interest to you" policy.

Does this build for better workers? The answer, we believe, is yes. No matter what a worker reads in the line of technical books, he will become more at ease with technical subjects and will become more interested in further ducation along these lines. We cannot be adamant and make this a school type of compulsive education, because that has failed many, many times. The old adage "You can lead a horse to water, but you can't make him drink" is just as true in education. The desire must come from the man himself.

The use of a library as a reference source to solve foremen problems has its points, but this alone is only a minor function. True, the reference is valuable, but certainly the references referred to by Al should be of the handbook type and each foreman should own his own handbook. Yet the handbooks should be part of the library for general reference by all personnel. The use of the library during the working hours is not a good policy; during lunch periods and after hours is the time when the library should be used. A regular checkout system can be installed for books. The loss is not great because the company can always collect through pay deduction for failure to return the book.

Many companies have libraries. This is not a new or novel idea, but it is a sound one. More companies

"I'm a machinist not a mechanic . . . I can make the parts . . . but I can't put them together. . ."



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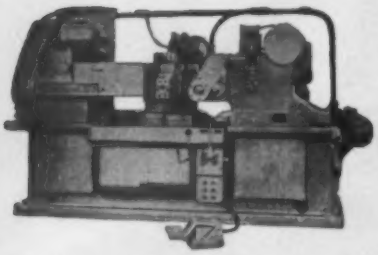

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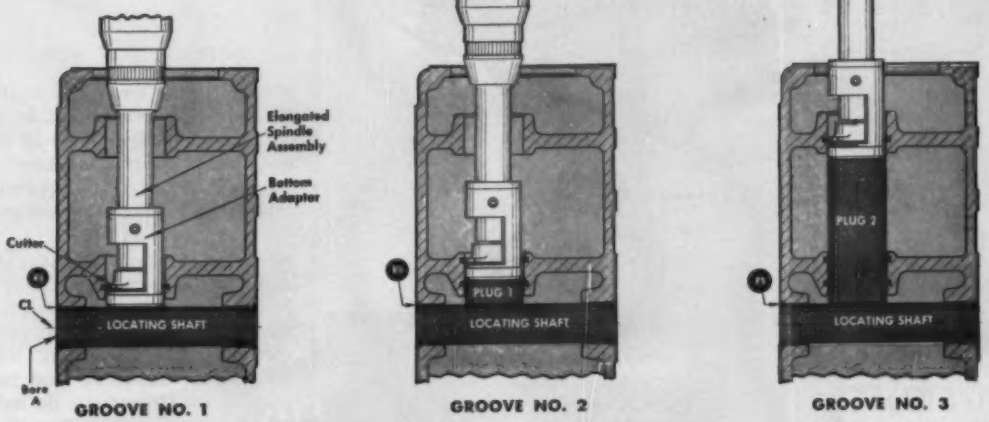
Waldes Truarc Grooving Tool pays for itself with big savings on one small run!

3 internal recesses cut in bores of 100 castings in 17.5 hours... including set-up time



GROOVE NO. 1 GROOVE NO. 2 GROOVE NO. 3

The job shown above called for three grooves located at prescribed distances from center-line CL of bore A. Depth and location tolerances: ±.0015".

Size and shape of the castings made nesting difficult for a boring bar operation. Exterior surfaces were unmachined, making alignment complicated. With two grooves over 7" from the housing's open end, boring bar chatter could have caused costly rejects.

To overcome these obstacles a Waldes Truarc Grooving Tool was equipped with an elongated spindle assembly and bottom adaptor. The tool was mounted in a drill press, the castings in a large vise. Grooves were then cut as follows:

Groove No. 1: A locating shaft was inserted into bore A as a reference surface and the tool piloted into the housing until the bottom adaptor banked on the shaft. The tool is designed so that the cutter rotates in a neutral position until additional downward pressure is applied. It then moves into cutting position until preset groove depth is reached, after which the tool idles. Release of pressure returns the cutter to neutral so that the tool may be withdrawn.

Groove No. 2: Plug 1 was inserted into the bore over the locating shaft and the tool again piloted into the bore. The groove was then cut the same way as Groove No. 1.

Groove No. 3: Plug 2 was substituted for the first plug and the cutting operation repeated.

All 300 grooves were held to prescribed tolerances. Set-up time: exactly 11 minutes. Operating time: 1050 minutes for 100 castings. Rejects: none!

No recessing problem is too tough for the amazingly versatile Waldes Truarc Grooving Tool. It's so simple even unskilled labor can use it accurately.

Write for a 20-page manual containing full information on Waldes Truarc Grooving Tool.

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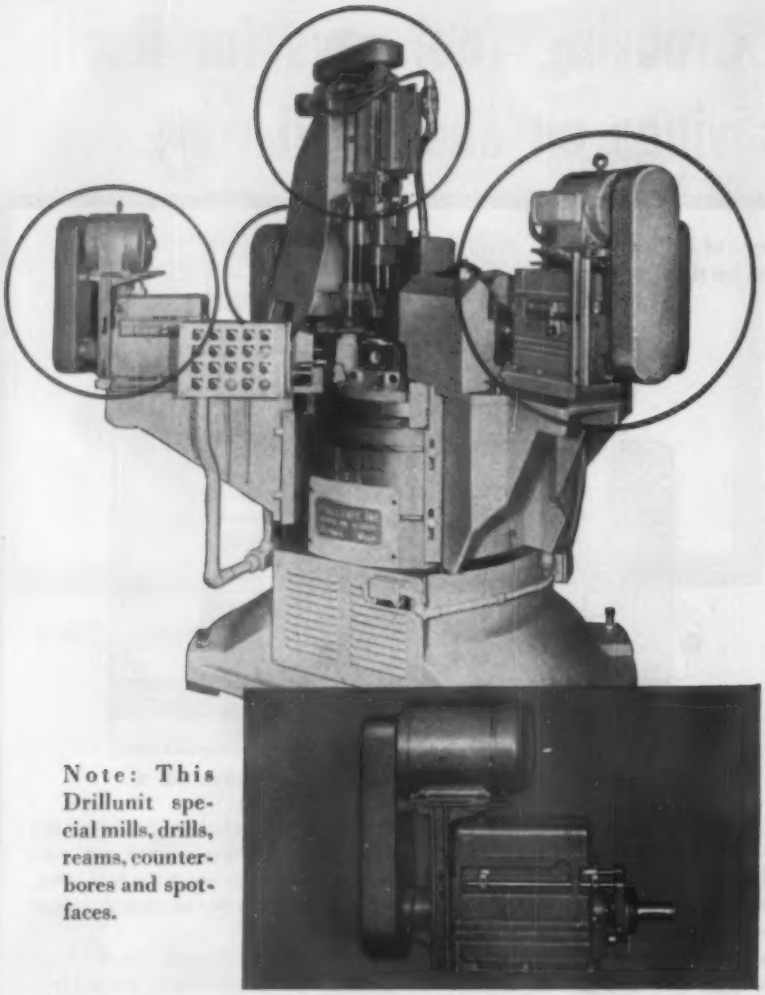

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would install libraries if they realized the advantages to them. We recommend a review of all conditions within a company before entering into such a library program, but by all means have some type of a library for the few employees who will use it. These few who wish to work to become better workers can and undoubtedly will be increased if the library is well founded and a cooperative policy established.

Charles D Townsend
West Hartford, Conn

SCHOOL FOR NOVICES

Would a basic course in facts about the plant, the product made, and facilities for making it be of interest and value to the workers in the shop, or are shopmen generally disinterested in such information?

IN-PLANT TRAINING courses are perhaps one of the hardest ideas to sell. Naturally the reason for this is human nature which rebels at being forced to do something different, and doing something that indicates that we as individuals do not know all the answers. It is true, however, that such educational programs are of value when they are firmly established and the novelty of the idea wears off. After a period of time people get used to doing a thing and it becomes a habit, a habit which sets up one hour of each week for school. The same resistance which was found in starting the program is often encountered if the program is stopped.

In the ideas presented by Ed and Al it would appear that a very hit-or-miss plan had been presented. This, in itself, has many drawbacks. One is that an employee doesn't

"Hoskins! Can't you eat that sandwich later?"

know what it is all about and will

UNIVERSALLY ACCEPTED FOR PRECISION LOW COST TOOL ENGINEERING IN ALL METAL WORKING INDUSTRIES

Direct Chilled 921-T Machined Aluminum Tooling Plate is here, in sizes up to 60 inches wide, 192 inches long and 12 inches thick. Made exclusively by Pioneer Aluminum Inc., the new material is manufactured under processes which control solidification and provide greater density, less porosity and higher mechanical properties to augment the characteristics of standard 921-T.

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does different things to different people. One never can predict what will

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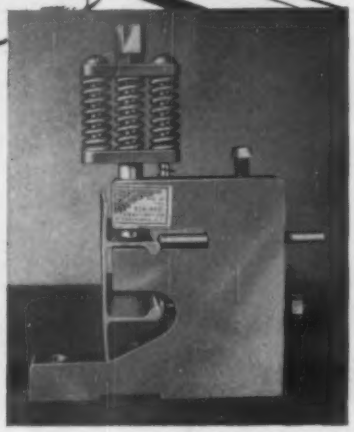
PUNCHING HOLES IN EXTRUSIONS, SHAPES AND ANGLES!



WALES "C-E" TYPE SELF-CONTAINED TOOLING

Hole Punching of formed and extruded shapes, is a simple operation with WALES self-contained C-E type tooling. Punch, die and stripping mechanism are all integral parts of the unit. Alignment is automatic! The same tooling may be used in any pattern and the set-up is FAST. A wide variety of units is available to fit almost every hole punching need. WALES C-E type tooling is a must for economy minded shops.

A few of the many shapes and extrusions punched with WALES C-E units.

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Specifications, illustrations and data to help you solve the toughest hole punching problems.

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"...the Wales-Way is the PLUS-PROFIT way"

know what it is all about and will not welcome with open arms the giving up a half-hour of his own time to find out. If the course is to be given as engineering, then the subjects discussed certainly must be developed beforehand starting at the elementary basic principles and advancing by steps to higher engineering principles. A definite schedule should be set and the program so developed that individuals will not want to miss a single class. It can be done, but it must be a program well planned in advance.

Questions regarding the company and its products can be one subject, and time can be spent regarding the over-all production, where the product is used, and how, and many other interesting facts developed, but this must not be hit-or-miss either. Interest is always held better through a well regulated program —one which permits people to take part but nevertheless is along a definite line of reasoning and approach. If you are to have an engineering course, then stick to engineering and inter-related subjects. If it is to sell the company to the employees, better say so, and develop an interesting series of lectures which will hold their interest. Don't try to cover up one with the other. The attempt will fail and only ill-will can arise from such a program.

A firmly established, carefully planned program, properly introduced, will not draw any more loafers than any other kind of program does. In fact, if they are loafers they will loaf on the job anyway, and perhaps something will spark them into becoming a worker. Education

"Oh—once you get to him, he's very approachable—"

does different things to different people. One never can predict what will happen when employees start talking about a program of "learning" in the plant. It can be the greatest asset the company has, for if it is well done, people will comment favorably about it and about the company. On the other hand, let it be muffed and the company will be talked of as the worst in the world.

It is, therefore, most important that before an education program of any type is started the whole idea be well thought out and studied in advance. Once something is started it is usually too late to make changes. The die will have been cast and a poor start will result in pretty poor relationships.

Charles D Townsend
West Hartford, Conn

IT IS ONLY natural to suppose that this proposed class in general engineering information is going to cost a little in production time but, as a consequence, there will be a quality factor which will more than offset the cost in time and money.

One of the first thoughts which comes to mind is that the content of such a course is only a repetition of that which the fellows would have had as high-school pupils. While this may be true to a limited extent we must take into consideration that although a person may have been exposed to basic theory it doesn't mean that the information he received amounts to anything effective. Then again, can we not say that the probabilities are that many of the workers had not completed their high-school course and are only too eager to jump in to make up time if given the proper chance?

I am a firm believer in receiving information on the job, and applicable to it, and it is with this thought in mind that I feel that the course as proposed will pay for itself many fold to both employer and employee. We all know from experience that there are those who would delight in sitting in at such a session for the purpose of getting a good chance of killing time, who just sit with apparent interest but who contribute little or nothing to the matter being discussed. Fortunately these duds to progress are few in comparison and would have to be chalked up to, as we would say in ye old days, "blow-holed-casting" losses.

It is incumbent upon a far-seeing employer to consider the long-range effect this class is going to have on his workers. The majority of the

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Exclusive pin-lock feature *locks* segments together by aligning pins—permanently holding the segments in perfect alignment. Since there are no aligning rivets to limit sharpening, up to 30% more cutting life is possible.

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Exclusive pin-lock feature (A) eliminates aligning rivets generally used in segmental saws. Saws with aligning rivets can only be sharpened down to line 1. Disston Segmental Saws can be sharpened down to line 2, giving up to 30% more cutting life.

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men are ambitious and want to get ahead and when they see that their employer has their interest at heart they will show their appreciation by diligent cooperation. It is only natural to assume that the employer has his own interest in view when he promotes such a course, as he realizes that the progress of the workers eventuates in higher production and universal satisfaction throughout the plant.

Such a course should deal with personal efficiency in order to instill in the participants the desire to make the most effective use of time. I would work in not only the happy relationship between employer and employee but stress the desire for harmonious cooperation between the workers themselves. It is a certainty that the employment of theorists will result in a complete breakdown of any course put on for plant consumption.

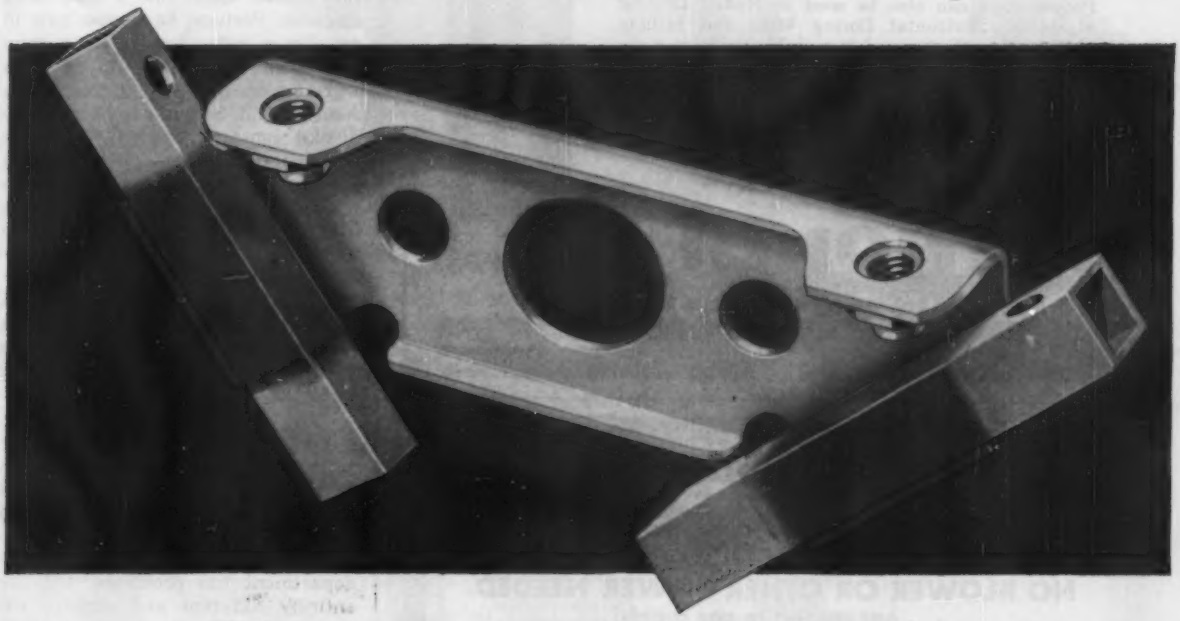
In order to be effective, a thorough study of working conditions should be made in advance so as to apprise the instructor of his limitations—to enable him to know just what kind of work is being done through the shop. A man wants to tie his theory in with what he is doing—he wants something put over to him that he can put his teeth into as it were.

Ed's idea that the class discussion will turn to sex is only natural for one to assume—outside of their take-home pay that subject seems to be the next thing of importance to many of the crew. Such things as sex interjections and irrelevant matters usually occur when the instructor has lost his grip. He should make it

"—It's a petition from the boys at the plant. They want you to stop picking on me so I'll be in a better frame of mind on the job."

Jack & Heintz Saves $15.84 Per Hour...

with TOCCO* *Induction Brazing*



Brazing Costs Down—When Jack & Heintz engineers switched from torch brazing to automatic induction, brazing cost of these inverter brush mounts fell from $.05 to $.006 each—a reduction of 83% in direct labor costs alone! Additional savings result because less cleaning is required after TOCCO, and fuel costs are much lower, too.

Brazing Production Up—While costs dropped, production on the part zoomed—from 40 to 360 brazed assemblies per hour. Furthermore, rejects and scrap, formerly high, are now negligible.

Versatility—The part shown is just one of over 25 parts, large and small, which alert J & H engineers have converted from old-fashioned brazing methods to modern, automatic TOCCO. Overall brazing costs (TOCCO brazing versus former methods used) are down 75%—brazing speed, up 100%.

If the manufacture of your product involves brazing, heat-treating, forging or melting of ferrous or non-ferrous metals, don't overlook TOCCO as a sound method of increasing production, improving product quality and slashing costs.

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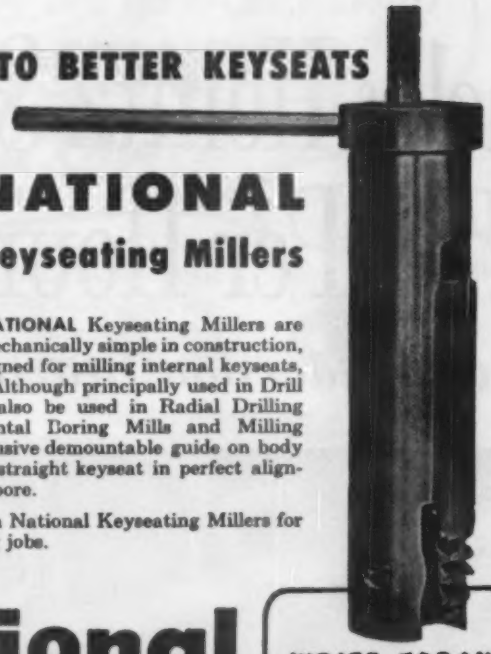

NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

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emphatic at the start that the subjects comprising the course are only those relevant to the progress of the workers as individuals and the plant as a whole.

Frank Van Horn
Auburn, Calif

BRAINSTORMING IN THE SHOP

Will lecture sessions to familiarize the workers with the over-all picture of products made in the shop tend to stimulate improvement in quality of production, or bring out new ideas from the men?

DON'T EVER under-rate a man or a machine. Perhaps he knows how to develop a better mouse trap than he appears to be able to do from working on his present job. It's a funny world. Sometimes people who dislike constant contacts, responsibility, and the like will work at a job where they do not have these problems. They like to dream up ideas but don't want to put them to work.

So it is with workers of all classes. A company which operates a suggestion system will many times find that the ideas forthcoming are worth thousands of dollars in saving the costs of manufacturing.

How to best accomplish the obtaining of such information in regard to products is a problem which perhaps has many solutions. It is not a simple formula which anyone can hand a company and insure success. Each company and sometimes each department has problems that are entirely different and require expert study. Why is it important to get just the right method? The an-

"I want you to teach this new man everything you know about our business, Morely. I'll be back for him in an hour."

Every one a Star

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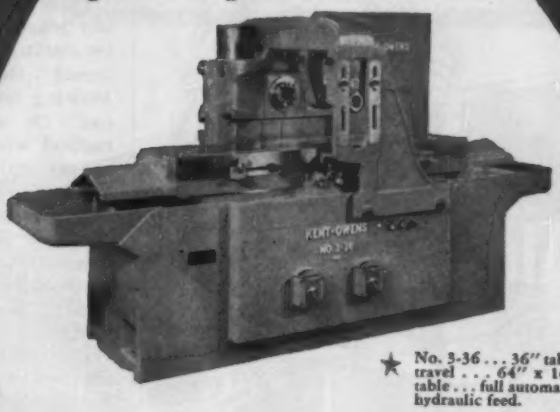

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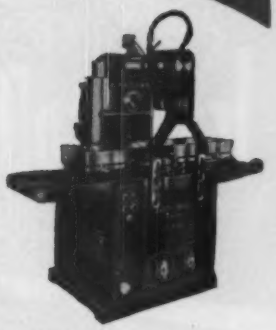
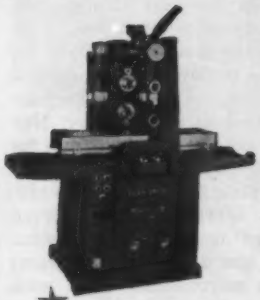


★ No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.



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You'll turn out milling jobs with stepped up speed and accuracy with the work on Kent-Owens Machines! These extra-rugged Millers are performance-proved . . . simple . . . versatile . . . practical in every detail. Advanced features throughout! Twin-post head mounting assures balanced load. Only two gear contacts, motor to spindle, means greater cutting efficiency. Check your needs! Write today for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.

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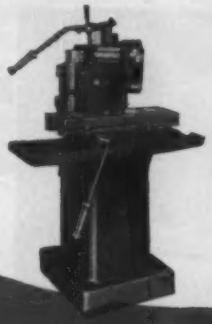

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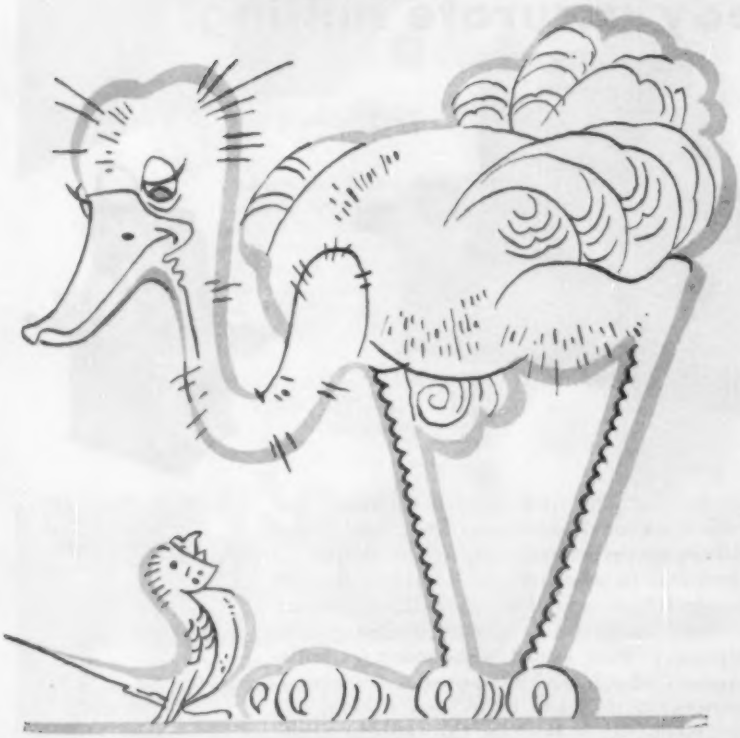

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swer is pretty obvious. Surely the desire is to get the best in ideas. Therefore it is necessary to have a program that will stimulate the thinking. Each company has a different problem in this respect. The type of labor, material and production facilities have a bearing on the answer.

Then there is the question of when and where such a program should be started. How should it be continued? On company time during working hours or after hours with pay? Or perhaps by some other method which will stimulate thinking without loss of productive time?

Again, each problem is different and each requires a study to determine the best method of approach. Suggestion systems in order to be successful cannot be just bought for a song and superimposed upon a company. They will not be successful if handled in this manner. Neither will a program of education for the worker be successful without first developing the best way to create interest. Workers who are forced to do things against their personal desires can tear down good programs faster than anyone can build such programs up. Never doubt that we, as humans, have a personal ability to destroy as well as to build. It is better to use a method which will appeal to the majority in order that they can help sell the program to others who are the doubting-Thomas faction of the company.

By all means show the product to the worker. Many have no idea where screw #9087 goes or for what purpose they make it with a special thread. Every person who knows what he is doing and for what purpose the product of his work goes

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is a better employee. They have more interest in what they do. They think about the over-all product and how it can be improved if there is some incentive for doing it.

Money talks, and all programs of this type (to be successful) should have some price tag. Not always is it necessary to have a high figure placed upon the ideas, but some stimulation is always good policy. This poses a big problem and just another reason why any old plan will not work in every company.

Have your Brainstorming Plan properly executed before you start. Let someone who knows the pitfalls develop it for you. Have a study made of your needs and a plan built to your special requirements. Specialists can save you time, money, and disappointment, but be sure of your specialist. Be sure that he is a registered professional engineer equipped to give service based on a national code of ethics. Don't take a chance with your company in trying to get ideas from your workers by methods which must be strictly trial and error. Your first mistake can be the last when you are dealing with the development of workers' talents and the harnessing of the thinking power of the human race in general. Get ideas but do it right.

Charles D Townsend
West Hartford, Conn

KEY-MAN BONUS PLAN

Can a fair bonus system be worked out for foremen that would spur production, but not at the expense of neglected equipment, or driving the workers?

HAVE WORLD wars set a precedent? We all remember the superhuman efforts of the worker in the last war —the new production records that were made. Ulcers, nervous breakdowns, and general fatigue were accepted as necessary sacrifices to defeat the enemy. The incentive was an urgency of national emergency, and numerous bonus plans served the highly useful purpose of providing tokens of appreciation for the important work accomplished in the gigantic logistics problem.

Having won peace, the worker is now entitled to the pursuit of happiness at his own pace. This is not to argue against progress, but the idea of a "quick buck," which is all too prevalent even as the necessity

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Change with Your Requirements

THIS MACHINE HAS BEEN REWORKED FOUR TIMES

The "building block" idea of machine tool design has gained much popularity in recent years. Greenlee has long built such flexibility into their transfer machines. For example, the machine shown here has been modified 4 times in 11 years to accommodate changes in product design. Protect yourself from costly obsolescence. Ask Greenlee to show you how.

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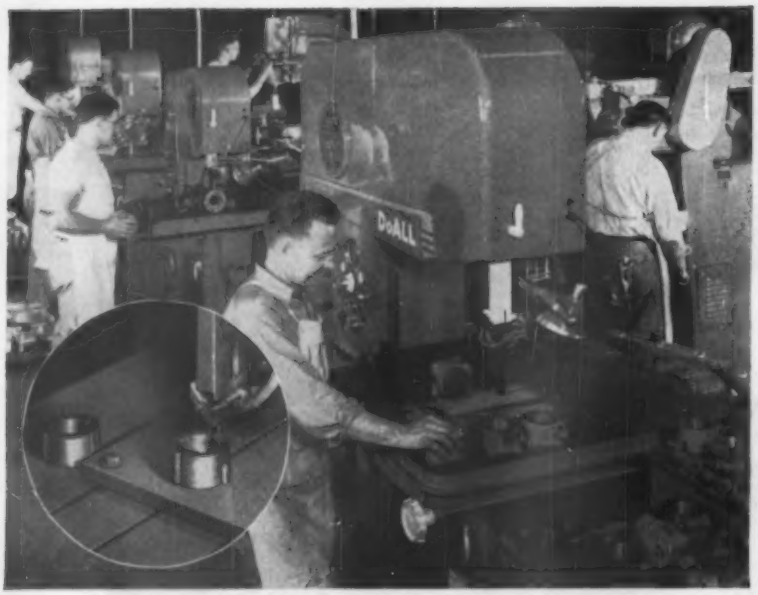

Parts are slotted faster at lower cost with continuous-cutting DoALL band machines. Note simplicity of fixturing shown in inset.

Shaping the Future with Tools...

Better means for moving people has become a multi-billion dollar problem for metropolitan leaders.

Easing of big city congestion involves everything from trains to traffic lights. Latest device under study to make the city more pleasing to the public is the "conveyor-belt sidewalk". Right now it's being used to channel pedestrian traffic more smoothly onto subway loading platforms.

Conveyor-belt sidewalks, another convenience made possible by modern production tools.

In the picture above, industry's newest basic machine tool is cutting slots in parts for the moving sidewalk mechanisms. This DoALL band machine does the job in ⅝ the time required by the former method. The parts shown are slotted in 18 seconds, including load and unload time. Saving per year per machine is $7500, nearly 100% annual return on the machine investment.

The future is being shaped by tools like the new DoALL saw. Their ability to increase human productivity and reduce costs will make possible a growing abundance of goods and services to make living more comfortable for everyone.

Manufacturers seeking to give the public more for its money will find more than 1500 cost-cutting tools available through local DoALL stores—machine tools, cutting tools, gaging equipment, tool steel, black granite surface plates and supply items.

Reprints of this series on economics plus "economic kits" available for employee education.

ASK FOR CATALOG describing DoALL band machines for sawing, slicing, filing, grinding or polishing any material from aluminum to titanium, plastics to glass. Call DoALL locally, or write.

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for more and more ceases to exist.

As a part of management a foreman shares the responsibility for a company's profit and loss and for the livelihood and well-being of hundreds of employees. This work, interesting and stimulating, provides its own incentive. The salary range for foremen varies with the man's ability to manage, his capacity for leadership, and his specialized knowledge of his job that enables him to turn out work in the right amounts, on time, and up to quality standards. From whatever point in the wide ranging scale there is always the incentive to move into a higher money bracket or even a bigger job. Under these conditions what is the use of a key-man bonus plan?

Whether admitted or not, a bonus plan is, as Al says, for no other purpose than to push production. His blunt summation of the folly of the plan is realistically clear. Ed contends it's more than just production. Formulas and personality tests, he says, will make it a real high-class contest. With unqualified confidence in the scientific wonders of industrial psychology he has no doubt that "they" can judge fairly. He is, in fact, confusing industrial psychology with legitimate competition for a prize.

Tests and formulas do play an important part in determining the right man for the right job, and have gained widespread use for Personnel purposes ever since the famous Army Alpha and Beta tests of World War I. These painstaking analyses are made before a man is hired for the job and through them a company has the opportunity to make the best possible selection. As people differ from each other, there will be foremen who are outstanding, mediocre,

"We'll let an impartial outsider settle the argument. We'll ask the boss."

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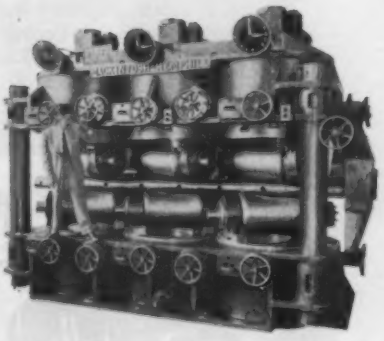

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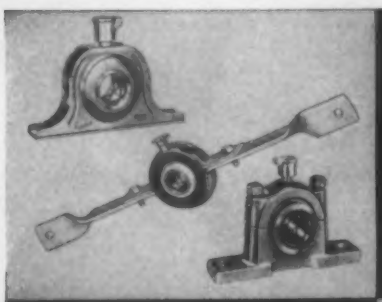

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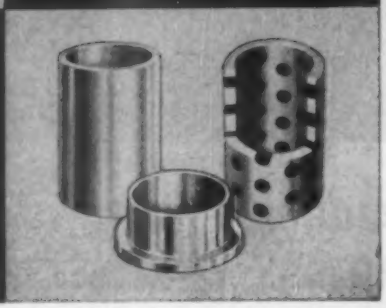

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and just average, but with leadership potential heading their lists of qualifications, a company may expect to develop this potential to its limits under a fair wage scale with ample incentive.

From Al's eager nature we might venture a guess that his potential is high but that he lacks the doggedness to climb to the top by way of the regular salary increases. He's an easy-come-easy-go sort of fellow and a key-man bonus plan is grist for his mill. The extra cash is what appeals to Al and it is a cinch that he hadn't given the "plan" much thought when he made his announcement to Ed. How else could he have established his own rating so quickly and started spending the "extra money" that was going to come "rolling in?"

In asking for high output through a key-man bonus plan does it follow that better foremen are a logical conclusion? Ed's case would prove otherwise. For what is Ed but a human being? He'd drive his men and get careless about housekeeping. Quality will suffer, machines break down. One day a worker will get hurt. Who's to blame? Not Ed. He is only giving the company what it asked for—more production. A plan that was doomed to failure is to blame. The personality boy with a knack for getting men to deliver gave them no cause to complain that they were being overworked. No one noticed the piles of waste accumulating in the corner, nor paid attention to the balky machines. Management was satisfied that Al could produce. His men were apparently happy.

We cannot dispute the effective results of key-man bonus plans in the past, but neither can we fail to recognize that waste in human well-being as well as material waste went hand in hand with high production.

A company that feels it is not getting the most out of its foremen should re-examine its standards for foremen. Satisfied that these standards can fulfill the needs of the company, it should make certain that each man knows the rules. Human beings are the foreman's "tools." His efficient use of these tools rests on time-tested practices of teamwork from a long range viewpoint. Money awards get quick but questionable results. It is possible, however, to stimulate the conscious efforts of leadership by non-financial incentives and gain long-lasting industrial benefits to the company as a whole.

E S Mulligan
Westbury, NY

The 21 elements of the Magnetron Beam Switching Tube fit into mica holding-wafers at top and bottom. Elements must be lined up to within .002" of specifications.

How costs are cut when inspection speed matches assembly rate

Electronic Tube Division, Burroughs Corporation, faced this problem: Find a way for inspection to keep up with assembly in the mass production of the Magnetron Beam Switching Tube. The answer: Optical gaging with a Kodak Contour Projector.

The assembly of components involves fitting 21 elements (one cathode, 10 targets, and 10 spades) into mica holding-wafers at top and bottom (see photo above). The end product must find all 21 elements lined up to within ± .002" of specifications. For pressure-type assembly, this is really crowding the limits.

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Fast, accurate optical gaging of the Magnetron Beam Switching Tube means a substantial saving for Burroughs. Electronic devices of this type are expensive to make. When tube elements are inspected immediately after assembly, imperfect units can be rejected with relatively small expense.

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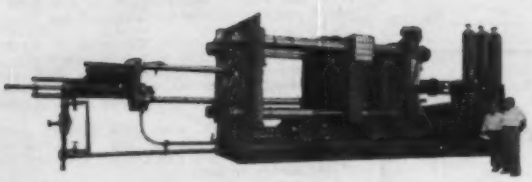

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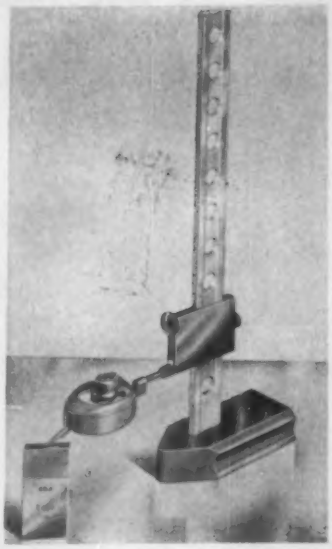

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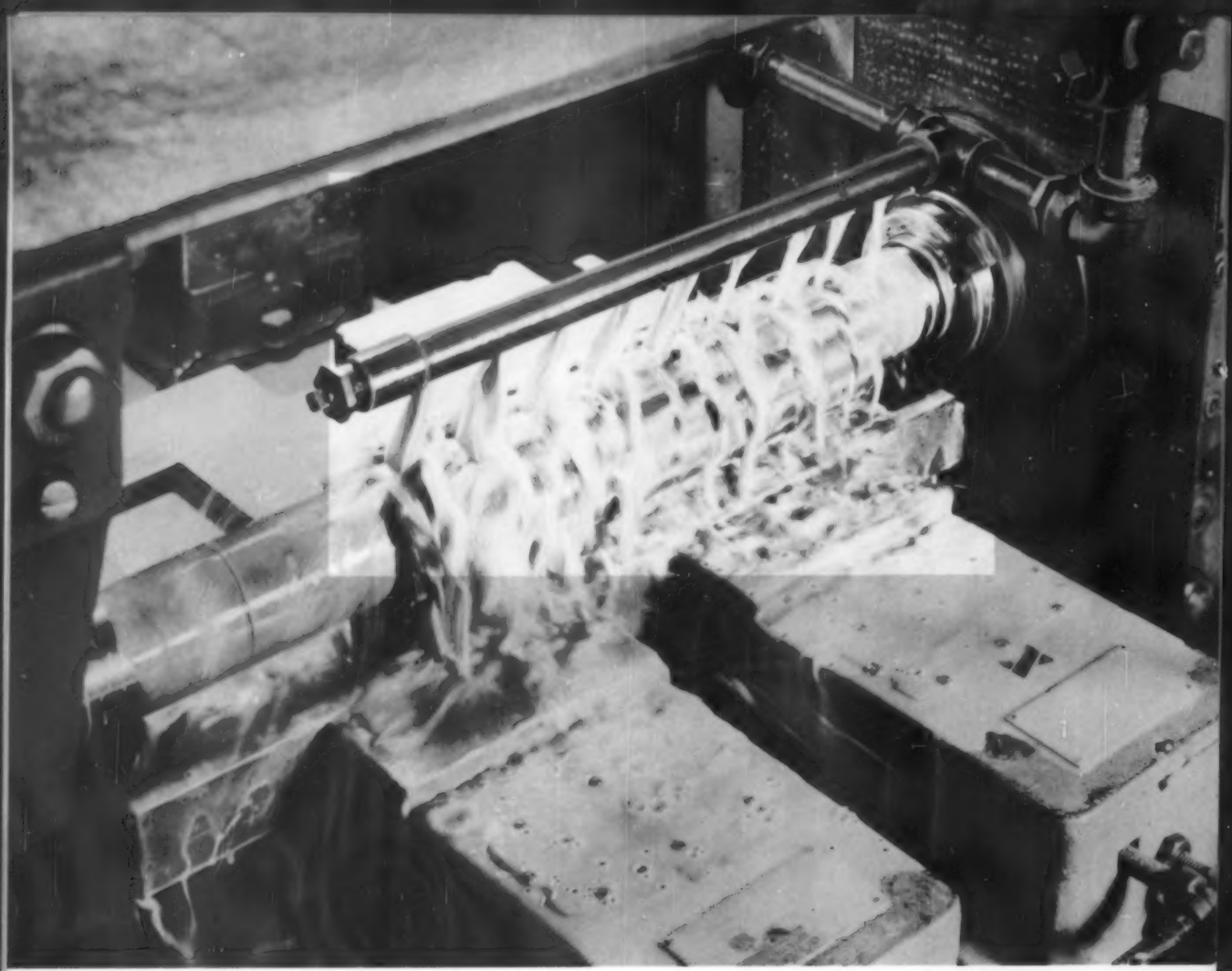
HEAVY DUTY SOLUBLE OIL

For heavier cuts—at higher speeds—with longer tool life—even in turning chrome-nickel steels and other tough alloys!



NEW GULFCUT HEAVY DUTY SOLUBLE OIL

increases the efficiency of a wide range of machining and grinding operations . . . because:

1. Its lubricating-cooling-protective properties meet the heavy duty machining needs of today.

2. It permits higher speeds, deeper cuts . . . gives finer finishes, longer tool life . . . offers greater protection against corrosion . . . helps eliminate rancidity!

3. It performs efficiently even when mixed 1 to 150 parts of water . . . and has exceptionally long service life!

This new Gulf product is a heavy duty soluble cutting oil with a petro-chemical emulsifier. Its applications include heavy hogging cuts, fast fine cuts, boring, and grinding of ferrous materials, tough alloys—such as titanium and chrome-nickel-moly steels—and soft, non-ferrous metals, such as aluminum.

Shop-proved Gulfcut Heavy Duty Soluble Oil won't separate or gum in wheels, slides or ways. It contains a potent rust inhibitor which provides greater protection against rust and corrosion. It has excellent emulsion stability even in hardest water. It has high surface-wetting properties for more effective cooling. It is anti-weld, anti-wear and anti-foam. Also contains an effective germicide to help eliminate rancidity and odor.

Gulfcut Heavy Duty Soluble Oil has been used extensively at W-K-M Division of A-C-F Industries, Inc., Houston, Texas. After months of diversified turret lathe operations: threading, boring, facing, turning, grooving—this Gulf customer says: "Gulfcut Heavy Duty Soluble Oil gives us long tool life, and excellent finishes."

Gulfcut Heavy Duty Soluble Oil has high surface-wetting qualities, for more effective cooling. For effective protection against rusting, three anti-corrosion agents are combined in the new oil.

Independent machine shop tests prove the superiority of GULFCUT HEAVY DUTY SOLUBLE OIL

Here are some of the first reports from the field on the performance of Gulfcut Heavy Duty Soluble Cutting Oil:

- "Grinds twice as many pieces before wheel dressing!"
- "Makes possible increase in depth of cut from ¼" to ½" per pass!"
- "Tolerances of 6 microns, instead of 16!"
- "Has made possible increased boring speeds!"

Get the full efficiency-economy story on new Gulfcut Heavy Duty Soluble Oil now! Call your Gulf Sales Engineer, at your nearest Gulf office, or mail the coupon.

GULF OIL CORPORATION • Dept. DM, Gulf Building • Pittsburgh 30, Pa.

☐ Please send more information on new Gulfcut Heavy Duty Soluble Oil.

☐ Please have a Gulf Sales Engineer call on me.

Name_____

Title_____

Company_____

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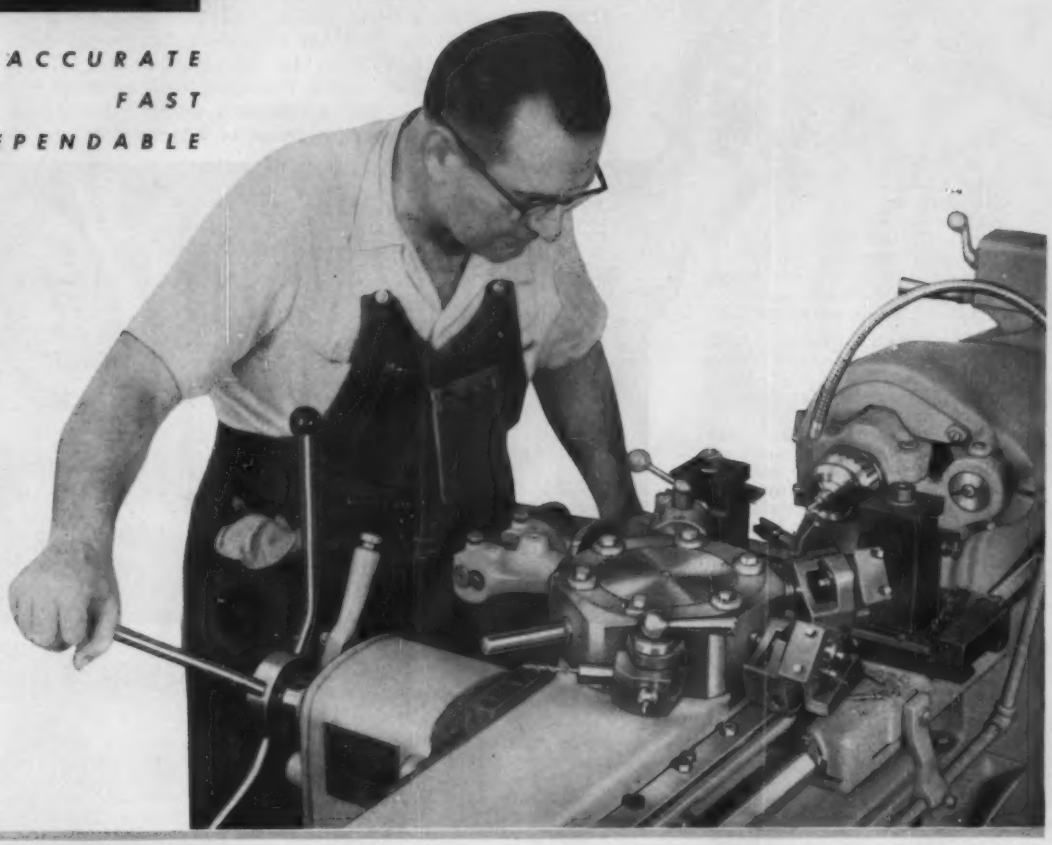
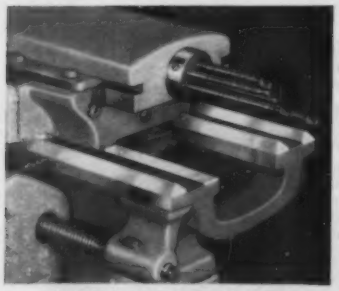
New 13" PRECISION TURRET LATHE

ACCURATE
FAST
DEPENDABLE





HARDENED BED WAYS

Hardened and precision ground bed ways can be supplied in lieu of regular at small extra cost—also hardened and ground cross-feed screw.

Up to 24 months to pay.

SOUTH BEND

- Power feed turret indexes and locks automatically on return stroke.
- Turret head indexes within .0005" measured 4" from turret face.
- Turret has 144 power feeds, .0006" to .0193".
- Lever on turret apron provides quick selection of fast, medium or slow feed.
- Each of six turret faces have independently adjustable feed trip and stop.
- Lathe carriage has 48 power cross-feeds, 48 power longitudinal feeds and 48 thread cutting feeds.

Send for complete information if you are interested in producing more precision parts at lower costs.

SPECIFICATIONS: Swing 13⅛" • Collet capacity 1" • Spindle bore 1⅜" • Turret ram effective feed 6½" • Turning feeds 48 • Facing feeds 48 • Threading feeds 48 • Turret feeds 144 • Spindle speeds 12 • Prices start at $2438.

SOUTH BEND LATHE, South Bend 22, Indiana

South Bend Lathe, South Bend 22, Indiana: Send information on 10", 13" and 16" Turret Lathes, —Engine and Toolroom Lathes, —Milling Machines, —Shapers, —Drill Presses, —Pedestal Grinders.

NAME_____

STREET_____

CITY_____ STATE_____

New NOPAK *Team*

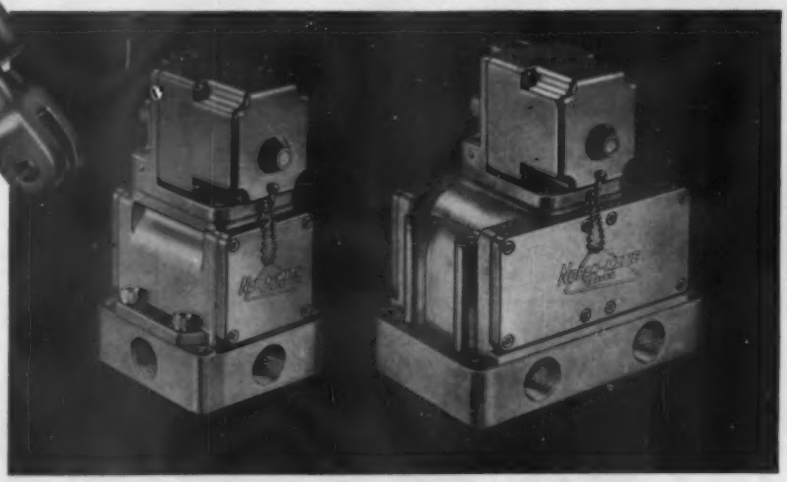
delivers PLUS VALUES in Air Power!

NOPAK Air Cylinders, long known for their dependability and economy, now can be applied to even greater advantage with the new Nopak-matic pilot operated air control valves. Full flow design and dependable performance make NOPAK Cylinders and Nopak-matic control valves the perfect "team" for "in plant" or O.E.M. applications. They deliver Plus Values that you can measure in terms of greater speed, higher efficiency, easier maintenance, a wider range of adaptability and versatility.

• NOPAK Class 1 and 2 Cylinders are available in 7 standard mountings in bore sizes from 1½" to 14" with a choice of non-cushioned, self-regulating or adjustable cushioned heads on all models.

• Nopak-matic, Pilot-operated, Poppet-type Air Control Valves are available in ¼", ⅜", ½" and ¾" pipe sizes for 2- or 3-Way normally open or normally closed operation, and 4-Way operation with master (air), single or double solenoid control heads. All 4-Way valves available, as standard, with choice of side or bottom ported sub-plates. Air pressures to 150 p.s.i.

Catalog 101-A and Catalog 105 provide complete descriptive and engineering data.



Other NOPAK Products for your Fluid Power Needs

• **CLASS 3 CYLINDERS**—for pressures to 2000 p.s.i. Compact steel plate square head and tie-rod construction. Honed steel tubing. Heads may be cushioned or non-cushioned. Available in 14 standard mounting styles.

• **CLASS 4 CYLINDERS** — High Pressure Hydraulic — Heavy, honed steel tubing with lock-ring flange construction. For hydraulic (oil) service at line pressures to 3000 p.s.i. Choice of cushioned or non-cushioned heads. Available in 5 standard mounting styles.

• **CLASS M CYLINDERS** (Mill Type) Welded flange construction, with honed steel tubing, eliminates tie-rods. Recommended for all types of Heavy Duty air or hydraulic pressures up to 650 p.s.i. depending upon diameter.

The NOPAK line includes cylinders and valves for a wide range of fluid power application — and its precision control. In addition to standard air cylinders, there are heavy duty, mill-type cylinders, square head and lock-ring flange type hydraulic cylinders. The NOPAK Valve line includes the famous packless rotating disc valves in both hand and foot models, high pressure hydraulic valves, Flotrol speed control valves and reciprocating valves.

NOPAK 2- 3- AND 4-WAY HAND VALVES are used to control single or double-acting cylinders at air or hydraulic line pressures to 250 p.s.i. Precision lapped seal eliminates packing, prolongs valve life. Disc rotating at right angle to stream flow permits throttling action or immediate opening to full pipe area. Pipe sizes from ¼" to 2".

NOPAK 2- 3- AND 4-WAY FOOT VALVES incorporate all of the features of NOPAK hand operated disc-type valves including the lapped-disc design and packless construction. They are available in 3 types which are adaptable to a wide variety of control needs. Pipe sizes from ¼" to 1" for pressures to 125 p.s.i.

NOPAK FLOTROL SPEED CONTROL VALVES provide uniform control of cylinder speed in one direction, free flow in the other. Features: quick, easy, precision adjustment without tools; greater capacity; easy installation because of compact in-line design; fit in tight places; made of rust and corrosion proof materials. Pipe sizes from ¼" to 1".

Write for Catalog SW-3

NOPAK *VALVES and CYLINDERS*

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"Increased valve cap production 31% with J & L 1113 Bessemer steel"

This valve cap for drums requires considerable surface machining, drilling and tapping. Comparison test with the previously used open hearth leaded steel shows J&L "1113" leaded Bessemer steel upped production 31% . . . permitted change from a 15-second to a 10⅓-second cycle. Surface finish is smoother. J&L leaded steels assure you higher cutting speeds, longer tool life. Get facts from your distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

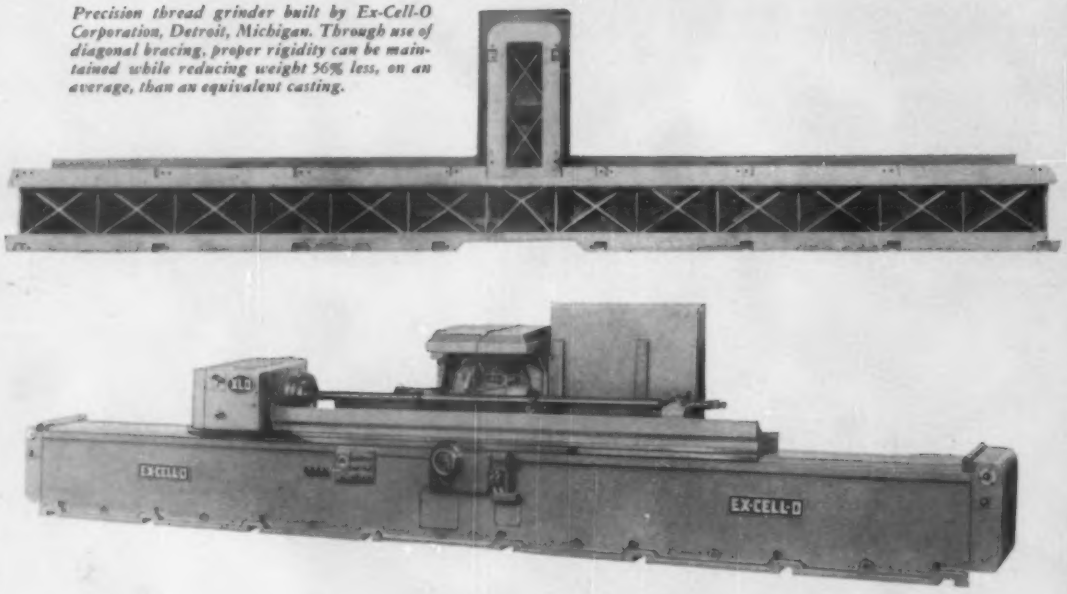
J&L STEEL

Jones & Laughlin

. . . a great name in steel

CUTTING COSTS AND WEIGHT WHILE DESIGNING FOR GREATER RIGIDITY

Precision thread grinder built by Ex-Cell-O Corporation, Detroit, Michigan. Through use of diagonal bracing, proper rigidity can be maintained while reducing weight 56% less, on an average, than an equivalent casting.



THIS precision thread grinder because of its great length in relation to width is particularly subject to twist as inertia is transferred from the work to the machine.

To achieve sufficient rigidity without resorting to a base of monstrous size and weight, welded steel is used.

This is possible because steel is 3 times stronger and 2½ times more rigid than gray iron. Costs are reduced because less material is needed, welding is fast, and welded bases require less machining and finishing.

Wherever welded steel is being used to improve products and to cut costs you'll find Lincoln arc welding products. Lincoln has pioneered the development of more efficient welding through better machines and electrodes—at less cost!

DESIGNERS! ENGINEERS!

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Machine Design Sheets sent free to engineers and designers. "*Procedure Handbook of Arc Welding Design and Practice*"—1300 pages, 1100 illustrations, 240 pages on machine design. $3.00 postpaid in U.S.A., $3.50 elsewhere. *Machine Design Seminars* conducted at our Cleveland plant. Write for information.

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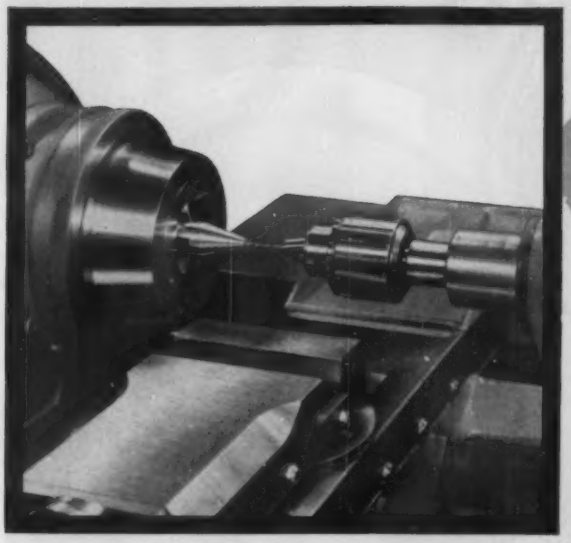
When steel is 3 times stronger

Has 2½ times the rigidity

Yet costs ⅓ as much as iron

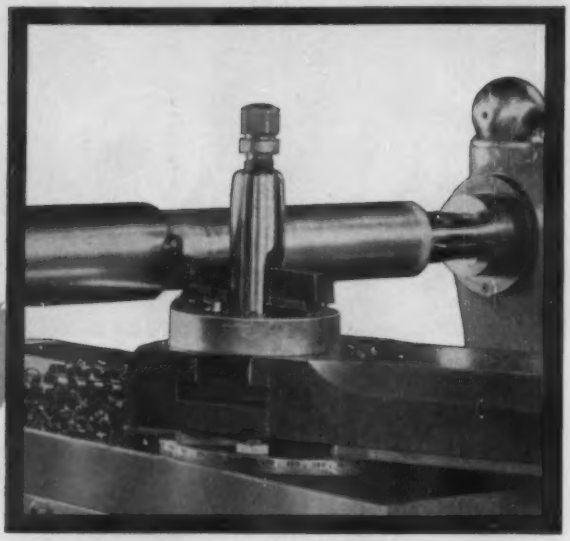
WHY use anything but welded designs?

Rivett's 2 for 1 Lathe!



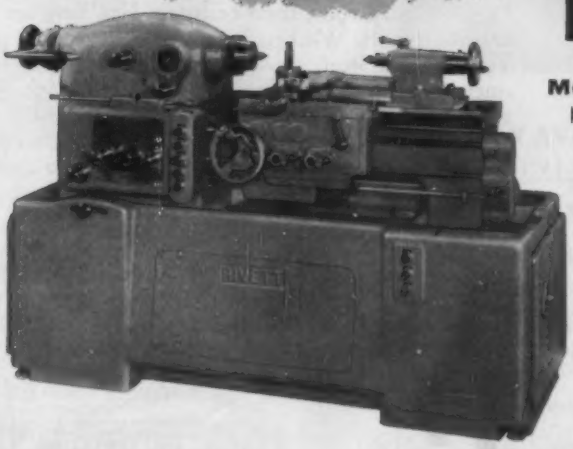
Sensitive...
As An Instrument Lathe

Responds to the lightest touch of the operator. Turns within .0004" in 12" length!



POWERFUL...
As An Engine Lathe

Full horsepower transmitted to spindle. Takes ¼" chip with .020" feed on cold rolled steel.



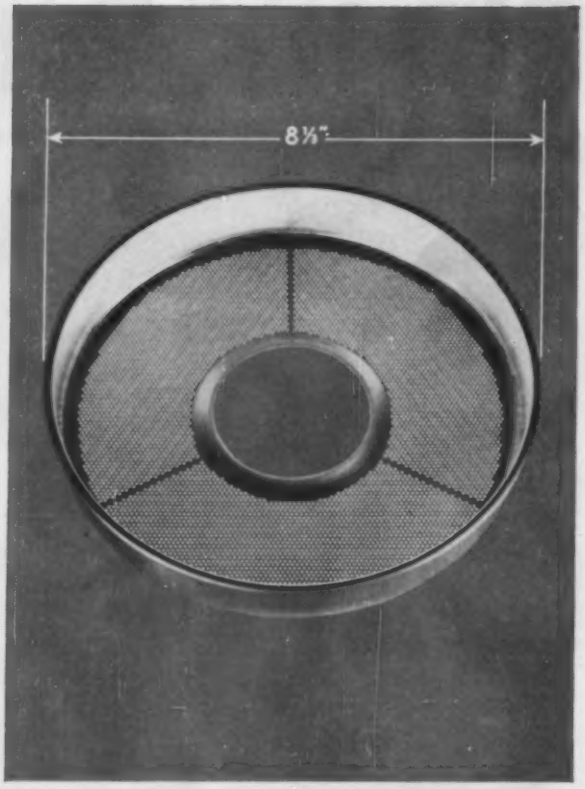
Model 1020S "Steelway"
PRECISION TOOLROOM LATHE

This lathe has the industry talking! Because of extreme precision, it has long been recognized as the top tool by master mechanics. Now, its adaptability and broad usefulness have highlighted its productivity. As one satisfied user states, "Our toolmakers go to a Rivett first in preference to our other lathes!"

RIVETT LATHE & GRINDER, INC.
Dept. AM-12A, Brighton 35, Boston, Mass.

Go to Rivett now for information about this big, beautiful machine.
Send for bulletin 1020B.

RIVETT
"Steelway" Lathes



WHICH DIE STEEL WOULD YOU USE

to be sure of getting 6,066 perfect holes in this die?

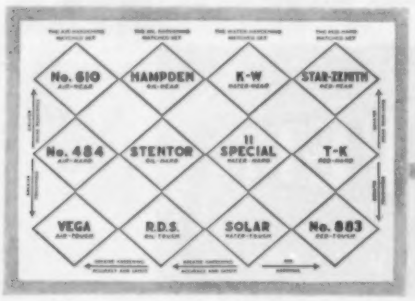
These tools are used in a 60-ton press to pierce 6,066 holes of .036" dia. in aluminum filter pans for a popular home appliance. The job demands "almost everything" from the die steel . . . good machinability and uniformity, minimum size change, extra safety in hardening and toughness to withstand heavy press loads.

The filter pans are 8⅓" in dia., and .025" thick. The 6,066 holes are perforated in three blows, as the die moves through three 120 degree indexing stations. Hundreds of machine hours are involved in drilling and taper reaming the tiny holes.

If the decision were up to you . . . on which die steel would you be willing to stake your reputation in view of this tough set of requirements?

In this Field Report from customer files, here are the amazing results: Working with Carpenter VEGA (Air-Tough) Die Steel, the company reports that not a single "hard spot" was encountered . . . *all 6,066 holes are in the die as planned.* The machining of VEGA was "considerably easier" than the machinery steel used for the stripper plate. What's more, there was no discernible change in size or shape after heat treatment . . . *the die held perfectly!*

You can count on good results from any Carpenter Matched Tool and Die Steel. Take the risk out of your tough tooling jobs. Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now for immediate delivery.



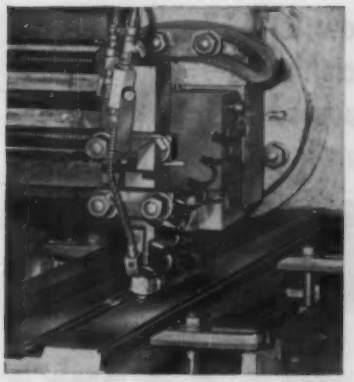
Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Co., 109 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

(Advertisement)



ANOTHER MIST-COOLING SUCCESS STORY

Fischer Machine Company, Philadelphia, Pennsylvania, solved their difficult planer job in cutting SAE 1035 channels by teaming Kennametal Tungsten Carbide Tools with a MILFORD Atom-Lube for Mist Cooling. Cutting at 300 S.F.P.M. with a feed of .050 inches, excellent tool life was obtained with the elimination of heat checking and tool breakage.

MILFORD Atom-Lubes are ruggedly designed for mist cooling tough industrial applications such as this Fischer Machine Company job. With an established record of success in sawing, grinding and milling, the MILFORD Atom-Lube offers new performance horizons for many other metal cutting tools. Adaptable to any piece of equipment, the MILFORD Atom-Lube is a natural where heat is a factor in any metal cutting operation.

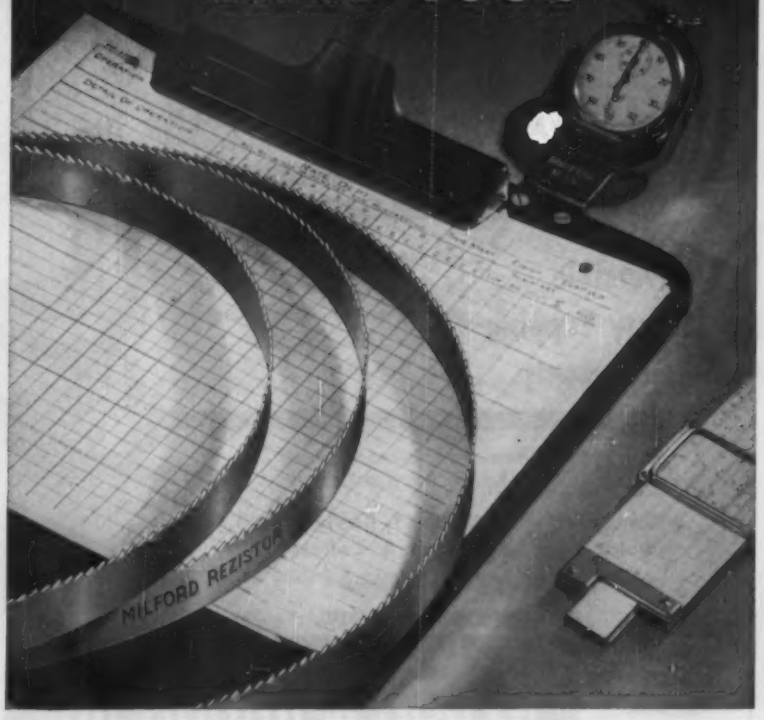
FASTER CUTTING OF MODERN, HARD-TO-MACHINE METALS

Band Saws made of high speed steel proved the answer to Lukens Steel Company's* unusual sample cutting problem at its mill in Coatesville, Pennsylvania. Rolling heavy armor plate, up to two inches thick, requires constant metallurgical sampling to insure quality control. However, due to the great toughness of the plates, fast economical cutting of samples was difficult and production delays resulted. Lukens Steel Company now uses MILFORD REZISTOR High Speed Steel Band Tools.

The Henry G. Thompson & Son Company, makers of MILFORD Hack and Band Saw Blades and other products, recognizes that today's tough, hard-to-machine alloys and stainless steels demand new and improved cutting tools. A pioneer in metal cutting, MILFORD has been responsible for many important advances and industry firsts in the field. Once again, MILFORD has led the way with the development of the first band saws made of "red hardness" high speed steel. These blades are MILFORD's answer to industry's requirement for more accurate, faster cutting, high production cut-off band tools.

**Distributor serving Lukens Steel Company — Diamond Specialty & Supply Company*

FASTER PRODUCTION
At Less Cost
MILFORD REZISTOR®
High Speed Steel
BAND TOOL



NOW AVAILABLE FOR IMMEDIATE DELIVERY... the REZISTOR Band Tool is specially designed for your heavy-duty band saw machines. This *red-hardness high speed steel* blade cuts many times faster . . . lasts far longer than any carbon steel band. It cuts consistently smoother and straighter than other cut-off methods . . . and chip loss of expensive metal is greatly reduced.

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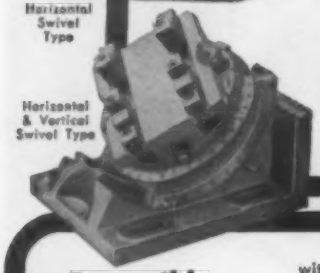
HACK SAW AND BAND SAW BLADES • HOLE SAWS • GROUND FLAT STOCK

Horizontal Swivel Type



Horizontal & Vertical Swivel Type

Multi-Purpose Vises

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Rigid in any position. Various capacities and extra soft jaws available.

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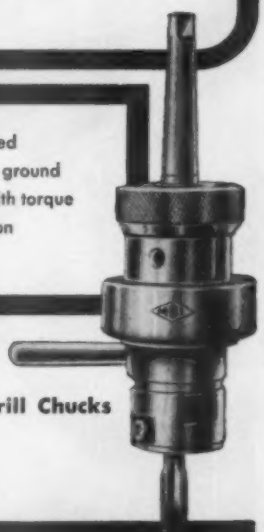
with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout.



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Complete details sent promptly on request

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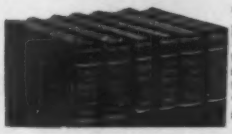
with a system that can work as well for you!



These machinists put themselves in line for advancement simply by spending a little time each day with this famous set of books.

With the tried-and-true help of the **American Machinists' Library,** they steadily picked up better and faster ways of doing their jobs. Instead of waiting for experience to grow, 21,617 men already have chosen *this systematic way* to insure their future.

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The Modernized AMERICAN MACHINISTS' LIBRARY

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HERE'S the gist of more machine shop experience than one man could amass in a lifetime of work . . . written by experts and made available in 6 compact volumes. You can check on your own methods, keep abreast of modern practices, solve problems right on the spot as they come up.

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What this Library gives you:—complete guide for everybody from shop executive to apprentice interested in the operation of machines — descriptions of all important varieties of machines, both manual and automatic, and methods of operating them—essentials of selecting machines, setting up work, and handling operations in reaming, tapping, planning, shaping, slotting, milling and broaching etc. etc.

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- *Open-side Accessibility*
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- *Built-in Spindle Motor*
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- *One-Shot Lubrication System*
- *Adequate Safety Devices*

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So GET A HILL with ALL the above features *plus* many other design improvements which insure rapid stock removal and accurate grinding of flat surfaces within the periphery of the grinding wheel. HILL Vertical Spindle grinders are built in table widths of 18", 24" and 30" with table lengths from 5 to 20 ft.

18" x 24" x 204" HILL Vertical Spindle Open-Side Hydraulic Surface Grinder. (Also built in Horizontal spindle design)

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Gun Drilling Does It

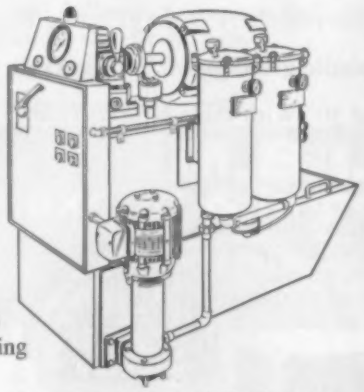
WITH SEALOL'S
DRILL ADAPTOR
AND
COOLANT SUPPLY UNIT

Deep or shallow precision holes in one pass . . . without those profit-cutting steps of boring, reaming or honing.

SEALOL DRILL ADAPTOR
— converts your regular, solid-spindle drilling equipment for precision gun drilling of all types.

Transfers coolant from a stationary source to the rotating gun drill at speeds to 10,000 rpm — pressures to 1,000 psi. Coolant is delivered through the gun drill directly to the cutting edge. Work runs cooler; drills cut faster, more accurately and with less power.

SEALOL HI-PRESSURE COOLANT SUPPLY UNIT
— provides a high volume of micro-clean coolant at proper pressures and volumes for precision drilling of *all* types.



Filters, cools and pumps coolant to drill adaptor at pressures to 1,000 psi — volume to 40 gpm (higher capacities available) for modern gun or oil-hole drilling.

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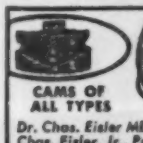

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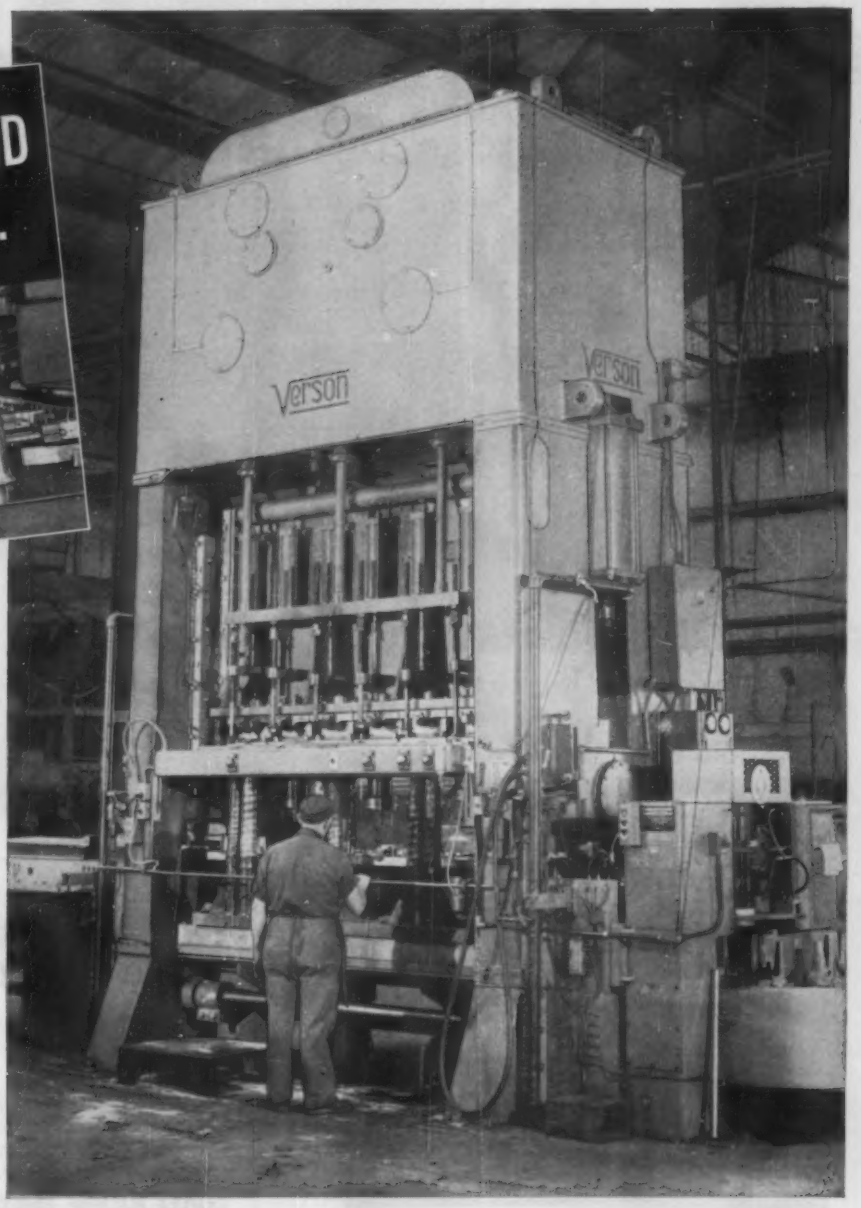

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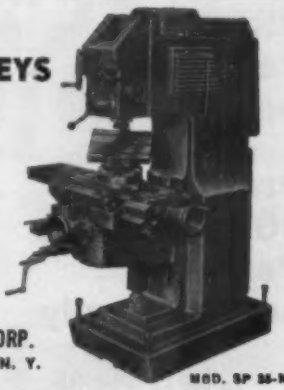

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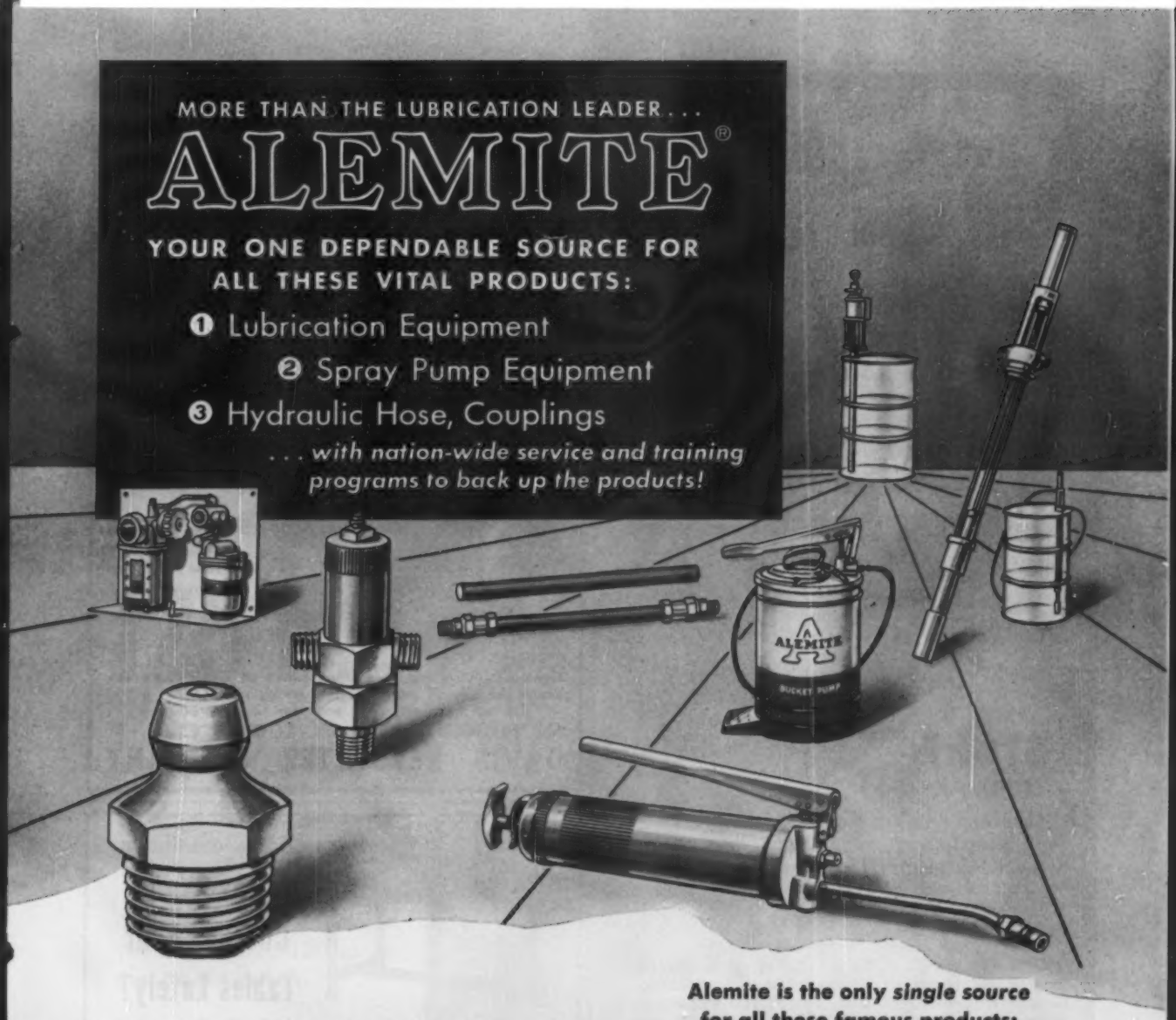

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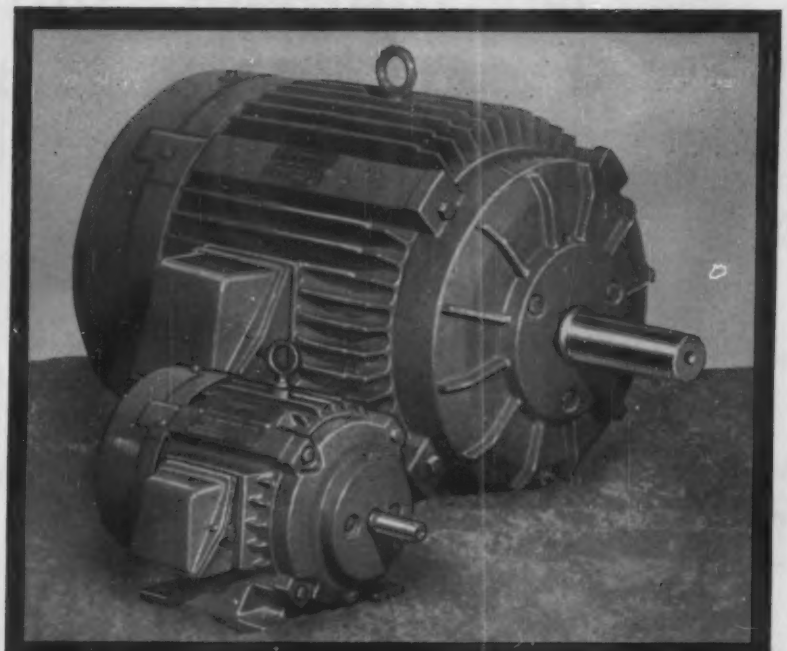

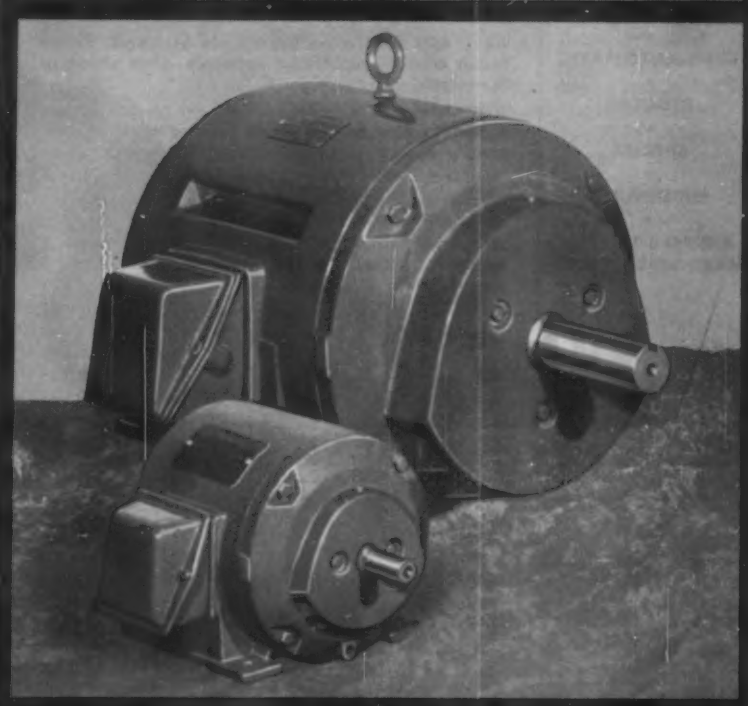

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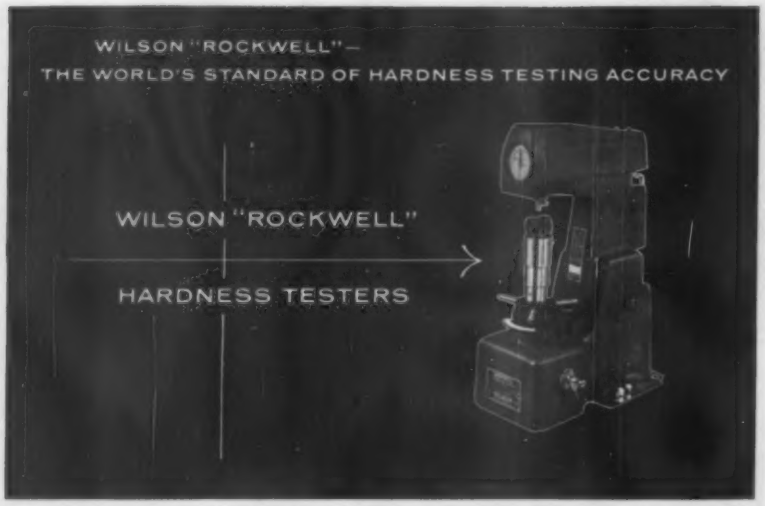

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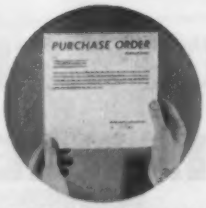
Write for one or all of these booklets
DH-325
DH-326
DH-327

From the *American Machinist* Library of *Tips for Top Shop Men*

BE sure your machine tools don't spend most of their "working" day as layout tables. A machine tool earns its keep only when it is cutting metal. Jobs can be set up on a surface plate or bench by someone else—frequently someone better at setup than the machine operator.



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- *fire risk*
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Production managers who've been wishing they could afford a larger lathe now have a chance to swing really big ...at medium cost...with new Axelson large-swing lathes.

Axelson's 44", 48" and 60" lathes are ready to go to work on the job of producing profits from big, odd-shaped pieces that ordinary lathes can't handle.

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For more information about these large-swing lathes ... at medium cost ... call your nearest Axelson representative or write for Bulletins MA12-5508 (44"), MA12-5510 (48"), and MA12-5509 (60").

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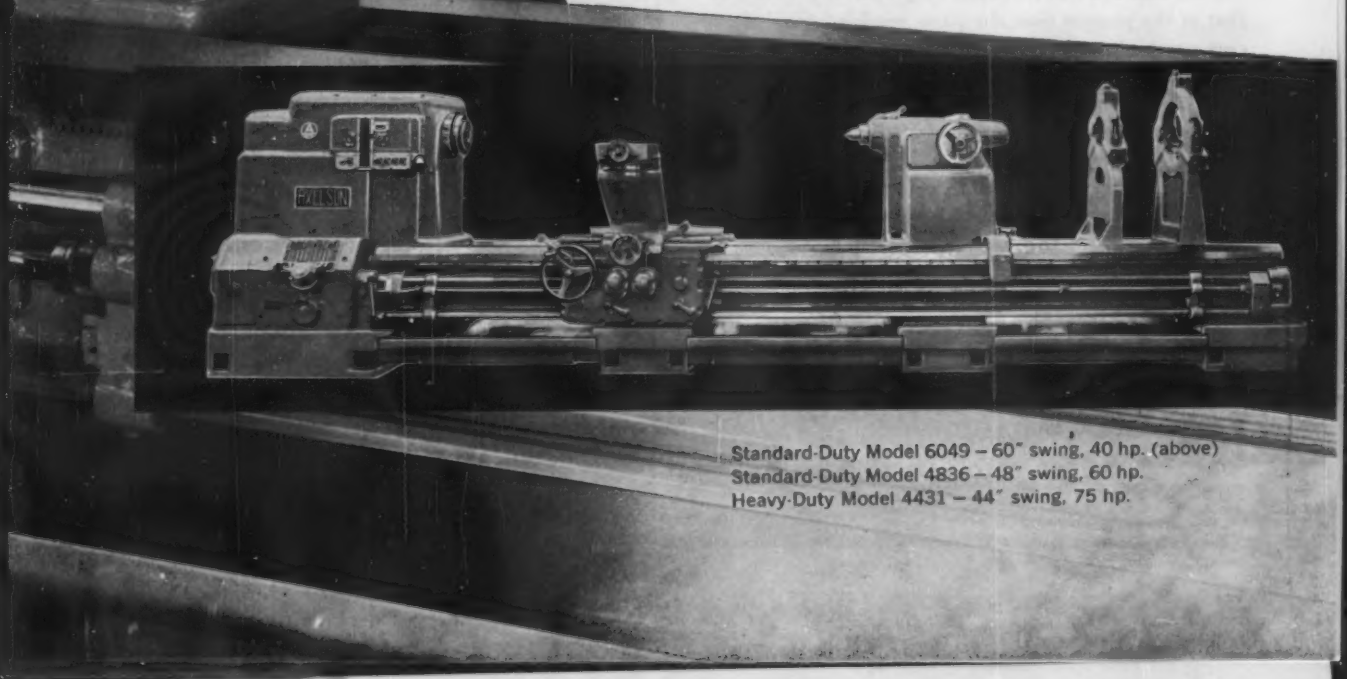

Standard-Duty Model 6049 – 60" swing, 40 hp. (above)
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TOOL AND DIE WORKS ELIMINATES HUMAN ERROR

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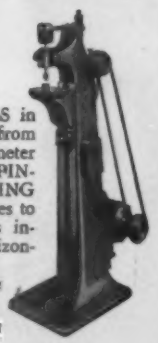

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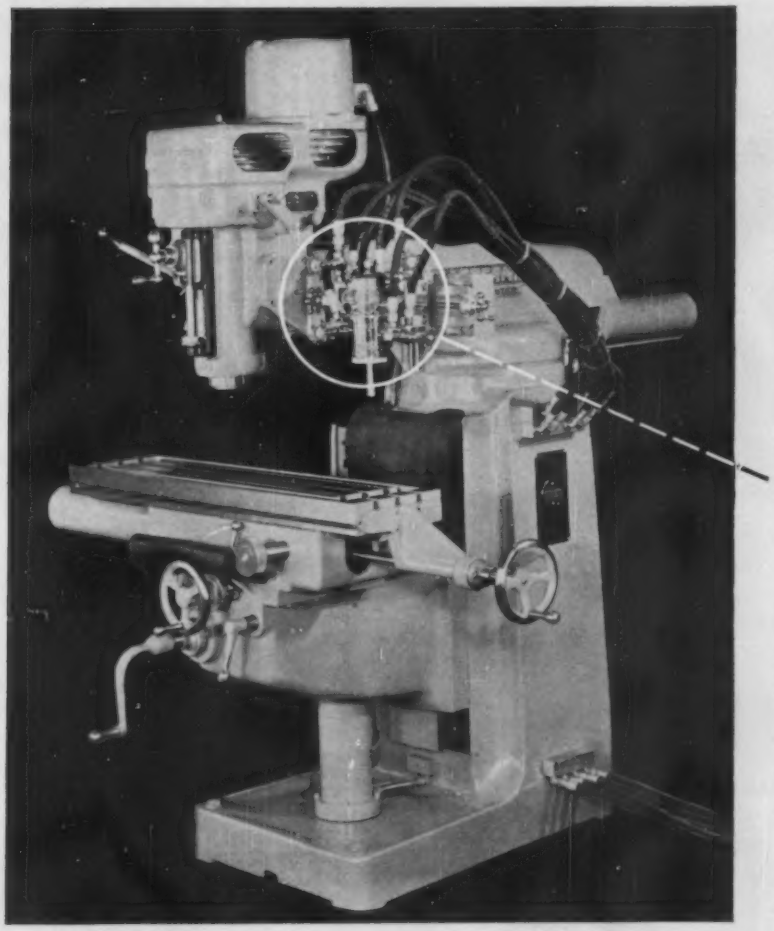

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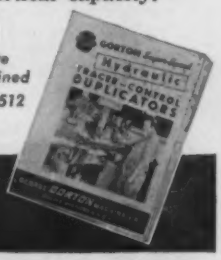

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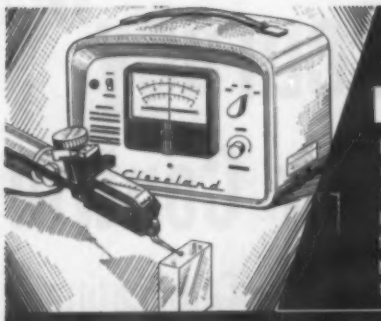

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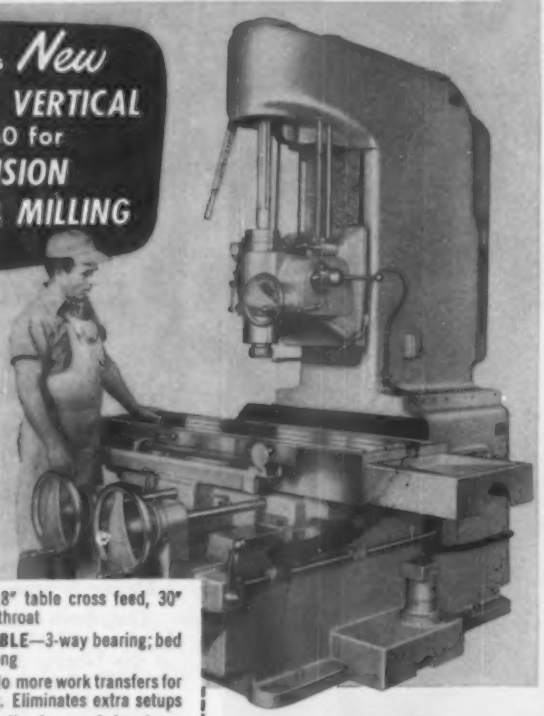

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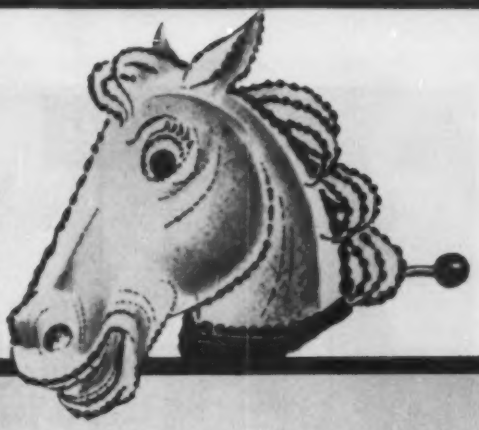
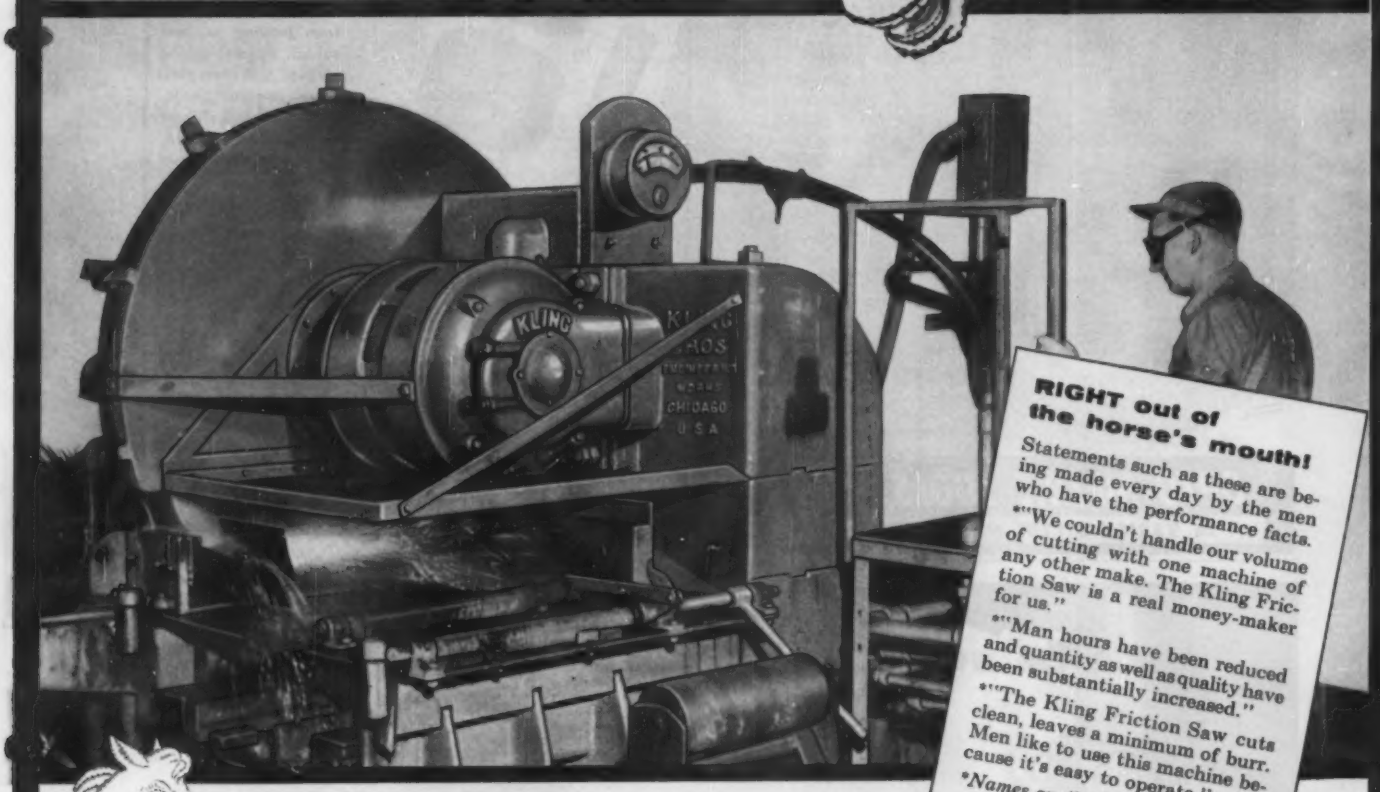




RIGHT out of the horse's mouth!

Statements such as these are being made every day by the men who have the performance facts.

*"We couldn't handle our volume of cutting with one machine of any other make. The Kling Friction Saw is a real money-maker for us."

*"Man hours have been reduced and quantity as well as quality have been substantially increased."

*"The Kling Friction Saw cuts clean, leaves a minimum of burr. Men like to use this machine because it's easy to operate."

*Names available on request.

*"Increased production 10 TIMES with a Kling friction saw."

"Production sawing of structural steel I-beams, angles, channels, etc. has been increased ten times with a Kling Friction Saw" . . . This statement was relayed to us by a man who had the performance facts—straight from the Workhorse's mouth.

And *men who have the facts* are relaying statements like these *to men who want to know the facts*, straight from the Workhorse's production records . . . All you have to do is ask them!

We will gladly supply you with a complete list of Kling Friction Saw users in your area. Write today . . . ask for a list of users of Kling Friction Saw Workhorses . . . and for the complete technical bulletin #4200. Kling Brothers Engineering Works, 1320 N. Kostner Ave., Chicago 51, Illinois.

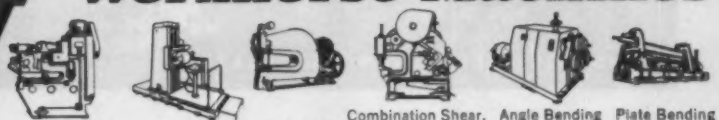
Kling Friction Saw Cuts Structural Steel in Record Time, for example:

Type of Section	Size of Section	Section Area Square Inches	Cutting Time Approx. (Seconds)
	18" x 70 lb.	20.46	10.8
	15" x 50 lb.	14.71	7.6
	30.42 lbs. 3½" Dia.	8.95	5.5
	2½	15.01	5.5

See the complete data in technical bulletin #4200.

256

Kling Workhorse Machines



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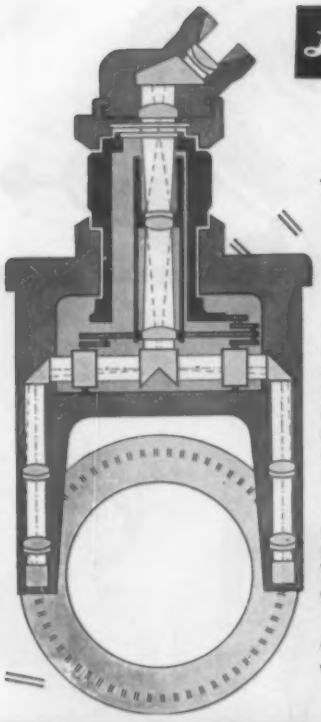

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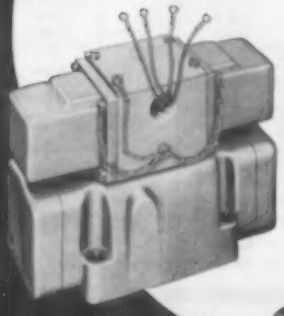

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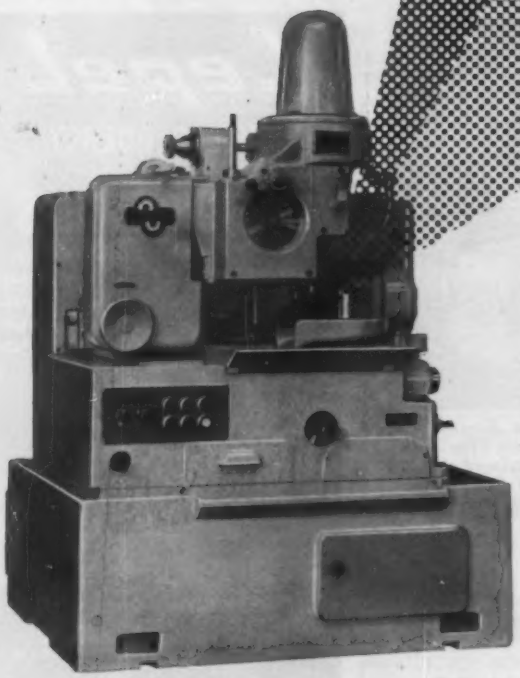

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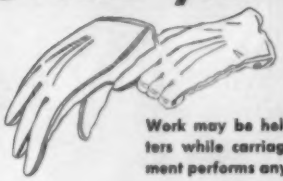

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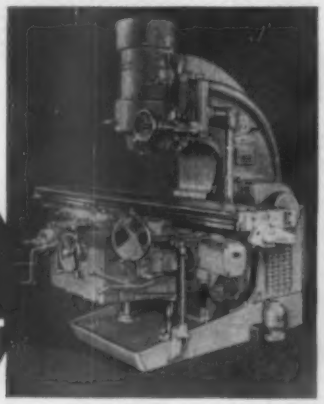

Illustrated is a Kearney & Trecker TF Knee Type Milling Machine equipped with a Gusher Coolant Pump.

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THE SURPLUS MACHINERY MARKET

Mild pickup in the used machinery market appears to be continuing around the Midwest; most dealers are timidly optimistic about the remainder of the year, but production in the shops is still pretty spotty.

One well known dealer, who says he's had more sales during the past month than in any month for a long stretch, says it's due to sales-pitch switch. His outfit goes after the larger companies that used to buy only new equipment; now, because of tight money conditions, they're willing to snap up used machine tools if they're in good condition, and will do the job on hand. He feels there's always some business available if the approach is right, and expects sales to be fairly good through the winter months.

On the other side of the coin, another Midwest dealer says "Things are tough all over, and there'll be no pickup until well into next year." He maintains that most surplus machinery dealers in his territory are sweating blood, and reaching out all over the country in search of "deals" that'll keep them alive. Problem isn't only in his territory, he says. He's had telephone calls from East Coast dealers wanting to work out cooperative deals in order to swing some business their way. He predicts present lull will last until February—maybe April or May—expects some dealers to close up.

Prices are softening at both the buying and selling ends. One Midwest dealer says he recently bought a 1950 milling machine for about 20% less than he would have had to pay for it a few months ago. While there is only minor price softening in the newer, larger machines, dealers are coming down considerably on the older models in an effort to move them. These machines are hard to move, he says, because smaller shops (the usual market for older types) are short on orders, pulling in their belts and making do with present equipment. Another dealer reports he has made cuts on all run-of-the-mine used machines, with minor adjustments on late-model prices. Most agree that this is a healthy thing. One dealer pointed out that price tags on equipment such as a 1941 miller have been considerably higher than when the machine was new. He's happy to see some easing from these levels.

New, foreign-made machine tools are cutting into the market in the San Francisco Bay area. And buyers of foreign equipment are coming from the group that customarily bought second-hand equipment. As a result, many dealers who formerly handled only used machinery are now selling new, imported machine tools along with their regular stock.

Explains one dealer, "Prices got too high on many used machines. It's the old story of supply and demand—good, recent-model used machinery is hard to get. Many dealers bid for the equipment, and prices went up."

"It is evident that demand for used machinery is beginning to slacken," another dealer states. "Small shops aren't doing any more expanding, and there aren't any new ones starting up. Everything points to lower prices ahead for used machines."

One exception: demand for precision machinery will continue good. It's needed for the increasing amount of work being done for the electronics industry, and supply is tight.

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7"—8"—10"—12"—14"—16" Bullard Mult-Au-Matics
35' Sellers & 24' Niles—1941
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GRINDERS:
Van Norman #418 Cylindrical — 1955 (never used)
#2 Brown & Sharpe Univ. Cylindrical—1955 (never used)
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100" Frauenthal Double Head Vertical—1943
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9" Nat'l Air Clutch—Weight 500,000 lbs.—1942

GEAR PLANER:
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LATHES:
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#6 Supermill Knee Type—67" Long. Travel—'57

JIG MILLS:
3B DeVlieg—1952

MILLING MACHINES:
#3—4—5—6 K & T & Cincinnati—1948

PRESSES:
Cleveland Toggle—200 Ton—48"x48" "Bed-20"& 14" Stke.—1952
Bliss Hydro Dynamic—72" Stke.—1945
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3'11" column American Helowizard Radial Drill, motor on head, 12 speeds, late.

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20" Gould & Eberhardt Back Geared Crank Shaper, 1944, swivel vise.

10" x 30" Norton Hydraulic Surface Grinder, late type, table size 10" x 39¾".

14" x 96" centers LeBlond G.H. Lathe, timken, 12 speeds, late type.

16" x 40" x 96" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 28" in gaps, mechanical feed, late type.

18" x 84" centers Boye & Emmes G. H. Lathe, 12 spindle speeds, timken, late, taper.

20" x 72" centers Boye & Emmes G.H. Lathe, 12 speeds, timken, late, taper.

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LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl Grinder 6x18 Plunge 1945
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CINN. Cyl. Grinder, 16x72 Plunge 1943
CINCINNATI 1066 horizontal 2-way, 1946
EXCELLO #33 Thread Grinder 1942
NORTON Cyl. Grinder, 6x18 Plunge 1944
BULLARD RW Vertical Turret Lathe
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads, DC drive
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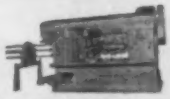

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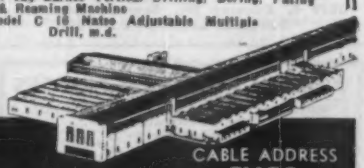

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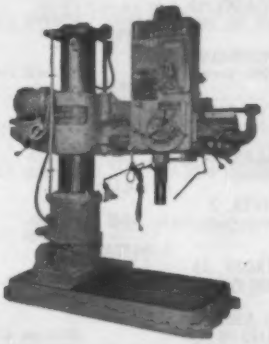

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Index of PRODUCTS ADVERTISED In This Issue

Abrasives, Coated 21, 210

Accessories & Attachments (Machine Tool) ... 26-27, 42, Insert Bet. 48A-48D, 186, 230

Bearings ..... 4th Cover, 152B, 216

Boring, Drilling & Milling Machines (Horizontal) ... 28-29, Insert Facing 152, 185, 187

Boring Machines Internal ... 2nd Cover, 82, 175

Boring & Turning Machines (Vertical) 14-15

Brazing & Soldering Equipment & Supplies 207

Broaching Machines 26-27

Cams 230

Chucks ..... 3rd Cover

Counters 20

Coolant Systems, Filters & Supplies 227, 230

Cut-Off Machines 218, 234, 242

Cutters, Abrasive 249, 256

Die Casting Machines 219

Die Sets 37, 191

Drafting Room Equipment & Supplies 234

Drilling Machines ..... 56-57, Insert Bet. 80-81, 132, 167, 202

Duplicators & Pantographs ... 33, 54, 239

Dust Collectors 182

Electrical Parts & Equipment ... 78-79

Electro Erosion (Electric Discharge & Ultrasonics) 48

Engineering & Production Services 198

Fasteners 34, 48D, 180, 201, 230

Files, Hand 40-41

(*Continued on page 250*)

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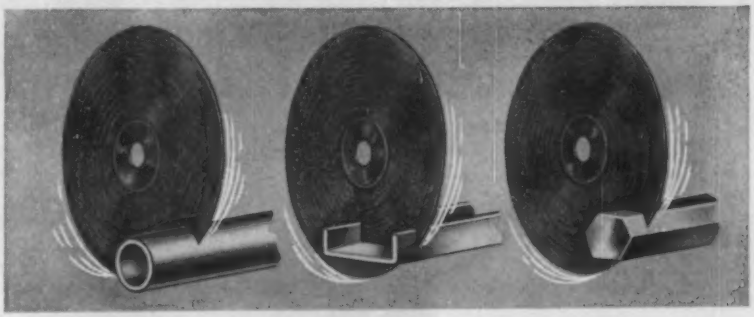

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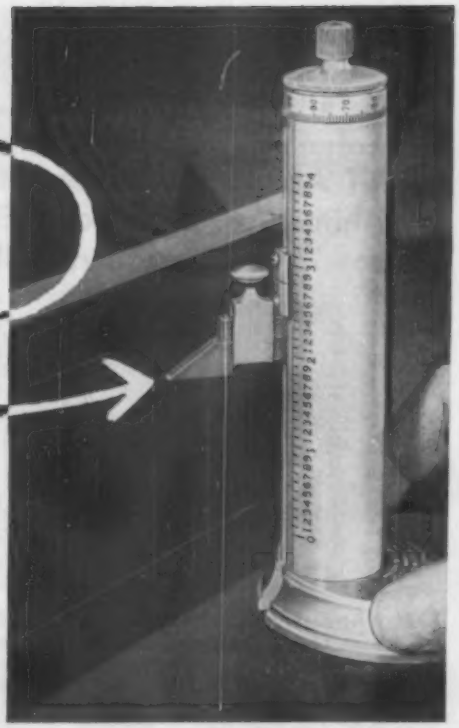

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Index of PRODUCTS ADVERTISED

In This Issue

•

(*Continued from page* 249)

Gages, Instruments & Testing Equipment 52, 161, 170, 176-177, 184D, 188B, 217, 232, 236, 238, 240, 242, 250, 252

Gear Cutting Machines ..3, 6-7, 130, 243

Gears, Speed Reducers Motor Reducers 179, 189, 218, 238

Gear Testers 3, 6-7

Grinders—Cutter & Tool 47, 218

Grinding Machines—Production ...8-9, 12-13, 16-17, Insert Facing 188, 229

Grinding Wheels.....18-19, 21, 171, 210, 256

Heads: Drilling, Grinding & Tapping 28-29, 35, 163

Heat Treating Equipment & Supplies 187, 207, 208, 244

Hydraulic & Pneumatic Parts & Equipment 36, 93, 136, 165, 169, 222, 242

Jig Borers 228, 232

Jigs & Fixtures 198

Keyseaters 208, 234

Lathes, Automatic 51, 54, 155, 159

Lathes, Engines 24-25, 33, 48A, 61, 69, 129, 190, 221, 225, 232, 237, 244

Lathes, Turret 22-23, 62, 155, 157

Lubricants, Cutting Fluids, Quenching Oils & Solvents ....44, 55, 75, 90, 172-173, Insert Bet. 220-221

Lubricating Systems & Equipment 233, 236

Marking Machines, Tools, & Supplies 76, 251

Materials, Cutting & Forming 66, 153, 168

Materials of Manufacture 46, 60, 68, 72-73, 78-79, 94, 134, 174, 184A, 192-193, 196, 203, 223, 224

Materials Handling Equipment 53, 165

Millers Die Sinkers, Profilers 4-5, 209, 239, 240

Index of PRODUCTS ADVERTISED In This Issue

Motors, Electrical 88, 205, 235

Planers 64-65

Presses, Forging & Forming Equipment & Supplies 43, 58-59, 86, 178, 181, 183, 184, 204, 215, 231

Pumps, Circulating 244

Riveting Machines 238

Saw Blades 40-41, 50, 194, 206, 227

Sawing Machines 50, 214, 230, 238, 241

Screw Machines; Chucking Machines ..... 32, Insert Bet. 32-33, 33, 45, 49, 200

Shapers & Slotters 98, 251

Shop Furniture 234

Special Machine Tools ..... 30-31, 67, Insert Bet. 184A-184D, 197, 198, 202, 213

Stampings 212

Tapping Attachments 188, 228

Tapping Machines 132

Thread Cutting Machines 10-11, 195, 254

Thread Rolling Machines & Tools 10-11, 77, 163, 254

Tooling Set up Equipment ..... Insert Bet. 80-81

Tools, Cutting ..... 38-39, Insert Bet. 48A-48D, 63, 71, 74, 84, 168, 201, 211, 232

Tools, Hand 186, 218

Tools, Measuring 80, 249

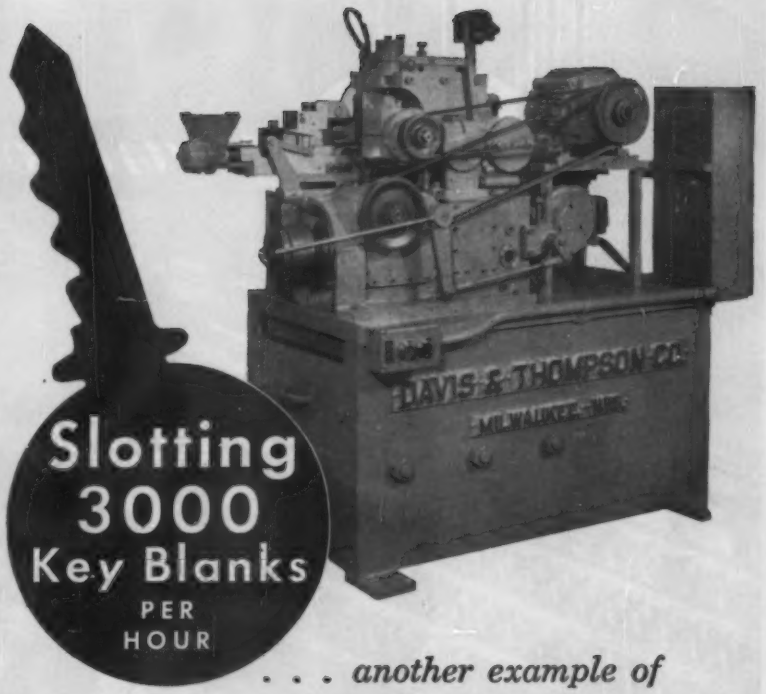
Tools, Portable 165, 199

Used & Surplus Equipment 245-248

Vibration Control & Mountings 189

Vises 228

Welding & Cutting Equipment & Supplies 224



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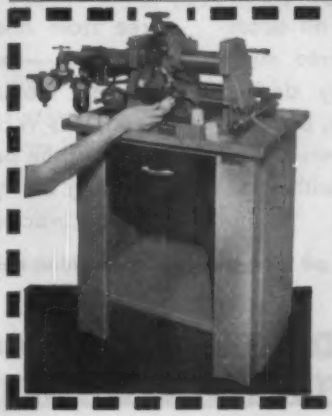

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ADVERTISERS INDEX

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	Page
Abrasive Machine Tool Company	Insert Facing 188
Acromark Company	251
Alemite	233
Allison Company Div. American Chain & Cable Co., Inc.	249
Aluminum Company of America	192-193
American Brass Co.	78-79
American Chain Division American Chain & Cable Co. Inc.	53
American Chain & Cable Wilson Mechanical Instrument Div.	236
American Tool Works Co.	61
Armco Steel Corporation	94
Armstrong Blum Mfg. Co.	50
Armstrong Brothers Tool Company	42
Axelson Mfg. Co., Div. of U. S. Industries Inc.	237
Baker Bros., Inc.	197
Bardons & Oliver Inc.	62
Barnes Co., Inc., W. O.	194
Bath Company, Cyril	86
Baush Machine Tool Co.	67
Bay State Tap & Die Company	84
Bijur Lubricating Corporation	236
Blake Co., Edward	218
Blanchard Machine Co.	70
Boston Gear Works	179
Boye & Emmes Machine Tool Co.	244
Bridgeport Brass Company	60
Brown & Sharpe Mfg. Co.	80
Buhr Machine Tool Co.	Insert Bet. 184A-184D
Bullard Co.	Insert Facing 152
Butterfield Div. of Union Twist Drill Co.	63
Carborundum Company	68
Carlton Machine Tool Company	56-57
Carpenter Steel Company	226
Chandler Tool Company	232
Chicago Pneumatic Tool Company	165
Cincinnati Gear Co.	189
Cincinnati Gilbert Machine Tool Co.	167
Cincinnati Grinders Incorporated	16-17
Cincinnati Lathe & Tool Co.	69
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Hydroform Division	43
Cincinnati Milling Machine Co. Cincinnati Milling Products Div.	55
Cincinnati Shaper Company	96
Cities Service Oil Company	75
Clark, Cutler McDermott Company	189
Cleveland Automatic Machine Co.	45
Cleveland Instrument Co., Inc.	240
Columbus Die-Tool & Machine Co.	198
Cone Automatic Machine Co.	49
Copperweld Steel Company	134
Cosa Corporation	254
Crucible Steel Co., of America	66
Davis & Thompson Company	251
Davis Keyseater Company	234
Detroit Die Set Corporation	191
Disston, Henry, Div. of H. K. Porter Company, Inc.	206
DoAll Company	214
Dow Chemical Company	184A
Dries & Krump Manufacturing Co.	184
Drillunit, Inc.	202
Eastman Kodak Co., Apparatus and Optical Division	217
Eisler Engineering Co., Inc.	230
Elox Corporation of Michigan	48
Ex-Cell-O Corporation	47, 82
Fellows Gear Shaper Company	6-7
Fosdick Machine Tool Company	Insert Bet. 80-81
Galland-Henning Mfg. Co.	222
Gardner Machine Company	21
Gear Grinding Machine Co.	130
General Radio Company	184D
Giddings & Lewis Machine Tool Company	14-15
Gisholt Machine Company	54
Gleason Works	3
Gorton Machine Co., George	239
Goss & deLeeuw Machine Company	200
Grant Gear Works Inc.	218
Grant Mfg. & Machine Company	238
Gray Co., G. A.	28-29
Greenlee Brothers & Co.	213
Greist Mfg. Company	250
Gulf Oil Corporation	Insert Bet. 220-221
Hannifin Corp.	136
Hardinge Brothers, Inc.	48A
Haynes Stellite Co., Div. Union Carbide Corporation	153
Heald Machine Company Sub. of Cincinnati Milling Machine Co.	2nd Cover
Heller Tool Co., Sub. Simonds Saw & Steel Co.	40-41
Hill Acme Company Acme Machine Division	229
Hones, Inc., Charles A.	208
Horton & Sons Co., E.	3rd Cover
Innocenti	185, 187
Johansson, C. E.; Div. of Swedish Gage Company	220
Jones & Lamson Machine Co.	155, 157, 159, 161, 163
Jones & Laughlin Steel Corp.	223
Kaiser Aluminum & Chemical Sales Inc.	72-73
Kent Owens Machine Co.	209
Kingsbury Machine Tool Corp.	132
Kling Bros. Engineering Works	241
Knight Machinery Co., W. B.	240
Laminated Shim Co., Inc.	212
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	26-27
Lavallee & Ide Inc.	74
LeBlond Machine Tool Co., R. K.	24-25
Lehmann Brandes Press Co.	129
Lepel High Frequency Labs, Inc.	244
Levin & Sons Inc., Louis	232
Lincoln Electric Company	224
Linley Brothers Co.	228
Logansport Machine Company, Inc.	242

ADVERTISERS INDEX

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- Internal Threads up to 5" diameter
- Racks up to 18" long

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Admits work pieces between centers	28"
Maximum length of thread ground	17-½"
Minimum thread diameter	.120"
Maximum thread diameter	8"
Minimum pitch	60 t.p.i.
Maximum pitch	3"
Width of single thread grinding wheel	.32"
Widths of multi-thread grinding wheel	.8"-1.2"-1.6"
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ADVERTISERS INDEX

	Page
Mackintosh-Hemphill Div. E. W. Bliss Company	215
Macklin Company	171
Manhattan Rubber Div. Raybestos-Manhattan Inc.	256
Maschinenfabrik Lorenz A. G.	243
Master Electric Company	88
Mayline Company, Inc.	234
M.B.I. Export & Import Ltd.	228
Metallurgical Products Dept., General Electric Co. Insert Bet.	48A-48D
Mid-West Abrasive Company	210
Milford Rivet & Machine Co.	180
Modern Machine Tool Company	242
Mohawk Tools, Inc.	211
National Acme Company	35
National Machine Tool Company	208
National Machinery Company	58-59
National Tool Company	195
National Twist Drill & Tool Co.	39
New Britain Machine Company, The Insert Bet.	32, 32-33, 33
Noble & Westbrook Mfg. Co.	76
Norton Company	18-19
Ohio Crankshaft Company	207
Olofsson Corporation	175
O'Neil-Irwin Mfg. Co.	178
Optical Gaging Products Inc.	170
Opto-Metric Tools, Inc.	242
Ottemiller Co., Wm. H.	230
Peerless Machine Company	238
Pioneer Aluminum, Inc.	203
Portage Machine Co.	219
Porter Inc., H. K.	218
Potter & Johnston Co., Sub. Pratt & Whitney Co., Inc.	51
Pratt & Whitney Co., Inc.	176-177
Producto Machine Co.	37
Randall Co., Inc., Frank E.	238
Randall Graphite Bearings Inc.	216
Raybestos Manhattan Inc.	256
Reed Rolled Thread Die Company	77
Reliance Electric & Eng. Co.	235
Rivett Lathe & Grinder, Inc.	225
Rockford Machine Tool Company	64-65
Rodgers Hydraulic Inc.	181
Ruthman Machine Company	244
S.K.F. Industries, Inc.	152B
Scherr Co., Inc., George	249
Schrader's Son A., Div. Scovill Mfg. Co., Inc.	36
Scully-Jones & Company	188
Sealol Corporation	230
Sheffield Corp.	52
Sheldon Machine Company	190
Shell Oil Co.	44
Shore Instrument & Mfg. Co., Inc.	232
Sidney Machine Tool Co.	Insert Bet. 184A-184D
Skil Corp.	199
Snyder Tool & Engineering Co.	30-31
Socony Mobil Oil Co., Inc., and Affiliates	172-173
South Bend Lathe Works	221
Stahl Gear & Machine Company	238
Standard Gage Company	188B
Standard Pressed Steel Co.	34, 48D
Staples Tool Company	71
Sterling Electric Motors Inc.	205
Stewart-Warner Corp.	233
Stone Machinery Co.	234
Stupakoff Division of Carborundum Co.	168
Tannewitz Works	230
Texas Co.	90
Thompson & Son, Company, Henry G.	227
Timken Roller Bearing Co.	4th Cover
Tomkins-Johnson Company	93
Torit Manufacturing Company	182
Triplex Machine Tool Corp.	232
Union Carbide Corp.	153
Van Norman Machine Co.	8-9
Veeder-Root Inc.	20
Verson Allsteel Press Co.	231
Vickers, Incorporated Div. of Sperry-Rand Corporation	169
Waldes Koh-I-Noor Inc.	201
Wales Strippit Company	204
Warner & Swasey Company	22-23
Webber Gage Company	252
Wheelock Lovejoy & Co., Inc.	196
Williams & Co., J. H.	186
Wilson Mechanical Instrument Div. American Chain & Cable Co.	236
Winter Brothers	38
Wolverine Tool Co.	230
Wood Co., R. D.	183
Wyckoff Steel Company	174
Youngstown Sheet & Tube Company	46

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CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 248

EDUCATIONAL
Books 248

EQUIPMENT
(Used or Surplus New)
For Sale 245-248

ADVERTISERS INDEX

Bennett Machinery Co. 248
Cincinnati Machinery Co. 246
Dony Machinery Co., D. E. 246
Eastern Machinery 247
Falk Machinery Co. 247
Hazard Brownell Machine Tools Inc. 246
Hyman & Sons, Joseph 246
Lucrens Bros. Inc. 246
Luria Brothers & Co., Inc. 246
Machine Tool Publications 248
Machinery Sales & Engineering Co. 248
McDonald Machinery Co. 246
Miles Machinery Co. 248
Montgomery Engineering Co. 247
National Machinery Exchange 248
Noll Equipment Co. 246
S & S Machinery Co. 245
Sal Metals Products Co. 247
United Tool & Stamping Co. 248

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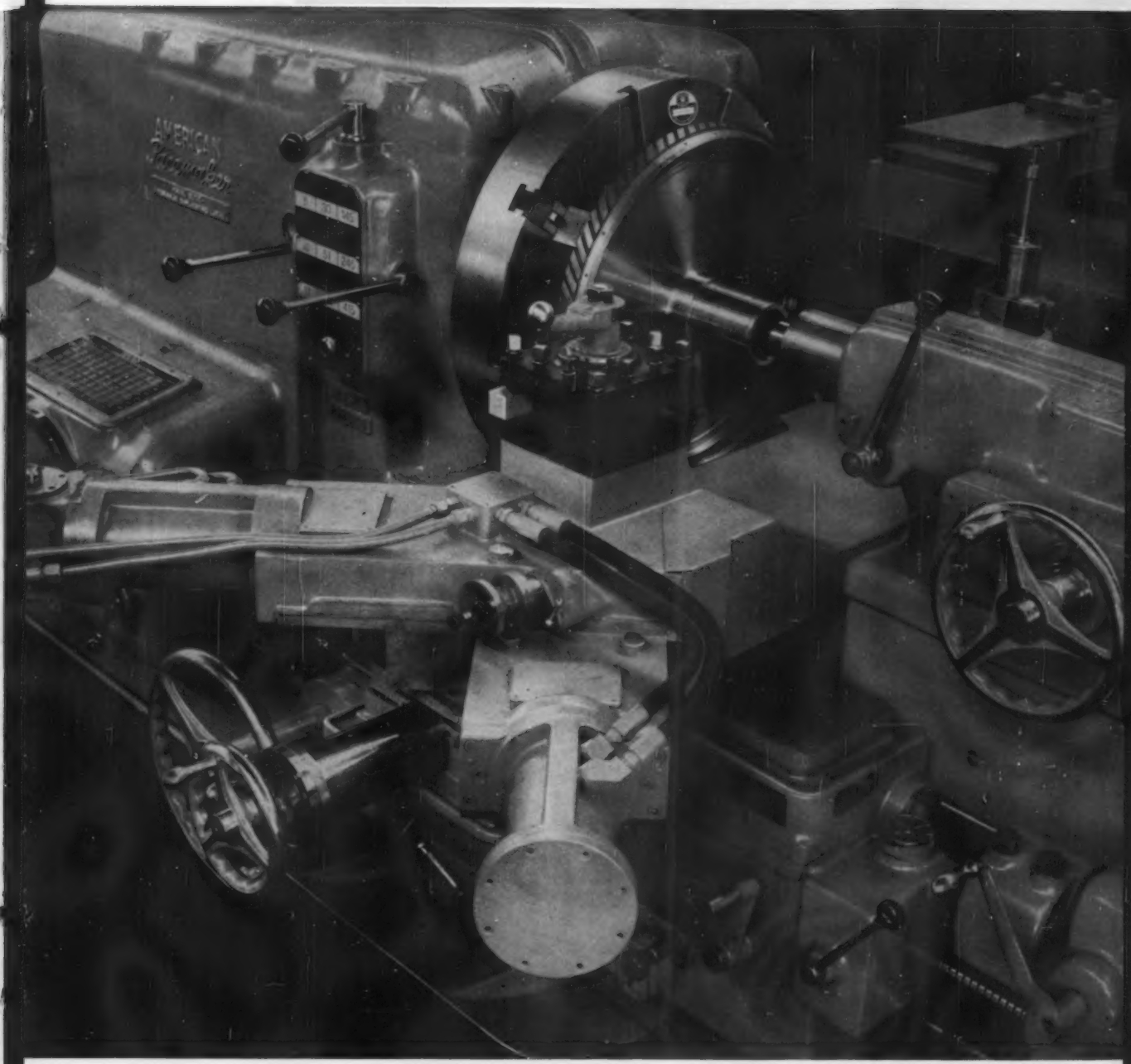

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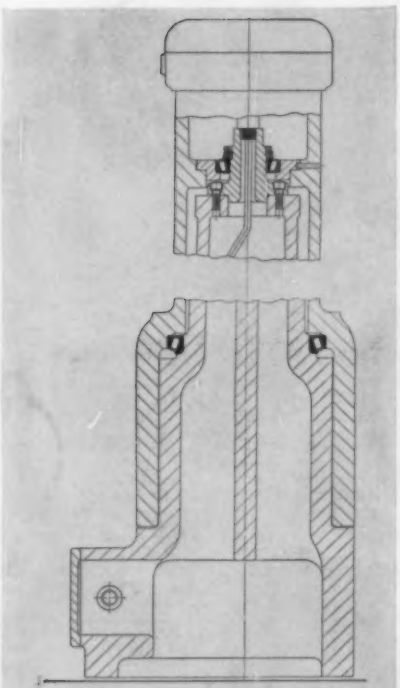

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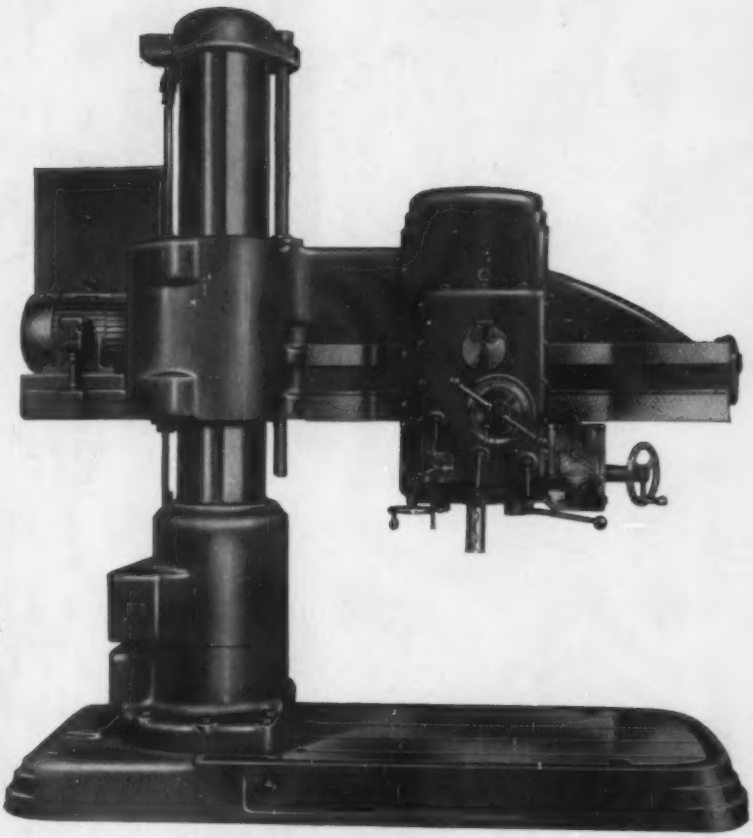

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